SONY

EDUCATIONAL RECORDER

ER-8020

SERVICE MANUAL

1st Edition

The material contained in this manual consists of information that is the property of Sony Corporation and is intended solely for use by the purchasers of the equipment described in this manual.
Sony Corporation expressly prohibits the duplication of any portion of this manual or the use thereof for any purpose other than the operation or maintenance of the equipment described in this manual without the express written permission of Sony Corporation.

Le matériel contenu dans ce manuel consiste en informations qui sont la propriété de Sony Corporation et sont destinées exclusivement à l'usage des acquéreurs de l'équipement décrit dans ce manuel.
Sony Corporation interdit formellement la copie de quelque partie que ce soit de ce manuel ou son emploi pour tout autre but que des opérations ou entretiens de l'équipement à moins d'une permission écrite de Sony Corporation.

Das in dieser Anleitung enthaltene Material besteht aus Informationen, die Eigentum der Sony Corporation sind, und ausschließlich zum Gebrauch durch den Käufer der in dieser Anleitung beschriebenen Ausrüstung bestimmt sind.
Die Sony Corporation untersagt ausdrücklich die Vervielfältigung jeglicher Teile dieser Anleitung oder den Gebrauch derselben für irgendeinen anderen Zweck als die Bedienung oder Wartung der in dieser Anleitung beschriebenen Ausrüstung ohne ausdrückliche schriftliche Erlaubnis der Sony Corporation.

TABLE OF CONTENTS

1. OPERATING INSTRUCTION

2. SERVICE OVERVIEW

2-1. Notes on Master Recorder/Student Recorder 2-1
2-2. Removal of ER-8020 from Booth Unit 2-2
2-3. Removal/Installation of Cabinet 2-2
2-4. Location of Main Parts 2-3
2-4-1. Location of Printed Circuit Boards 2-3
2-4-2. Location of Main Mechanism Parts 2-4
2-5. Connector Specification 2-5
2-6. Removal/Installation of CPU-239 Board 2-6
2-7. Removal of Mechanism Deck 2-7
2-8. Replacement of Main Parts 2-8
2-8-1. Plunger Solenoid Replacement 2-8
2-8-2. Pinch Roller Replacement 2-8
2-8-3. Erase and Record/Playback Heads Replacement 2-9
2-8-4. Assist/Capstan/Reel Motors and Assist/Capstan Belts Replacement 2-10
2-9. Removal of a Cassette in the Power Off State 2-11
2-10. Note on Suffix Change 2-11
2-10-1. When Used as Master Recorder on AU-242 Boards Having Suffix Number 11 2-11
2-10-2. CPU-239 Boards Having Suffix Number 12 2-11
2-11. How to Cleaning 2-12
2-11-1. Cleaning the Cabinet 2-12
2-11-2. Cleaning the Heads 2-12
2-12. Notes on Spare Parts 2-13
2-12-1. Notes on Spare Parts 2-13
2-12-2. Replacement of Chip Parts 2-13
2-12-3. Removal/Installation of Flexible Card Wire (7P, 27P, 16P) 2-14

3. DIAGNOSIS

3-1. Error Code 3-1
3-2. Special Mode 3-2
3-2-1. Operation 3-2
3-2-2. Function 3-2
3-3. Service Mode 3-3
3-3-1. Operation 3-3
3-3-2. Diagnosis 3-4

4. ALIGNMENT

4-1. Mechanical Adjustment 4-1
4-1-1. EJECT Plunger Position Adjustmnent 4-1
4-1-2. Head Height Adjustment 4-1
4-1-3. Measurement 4-2
4-2. Electrical Adjustment 4-2
4-2-1. Preparation Before Electrical Adjustment 4-2
4-2-2. Description of Special Operation 4-3
4-2-3. Azimuth Adjustment 4-4
4-2-4. Tape Speed Adjustment 4-5
4-2-5. Playback Level Adjustment 4-6
4-2-6. Bias Frequency Adjustment 4-7
4-2-7. Bias Current Adjustment 4-8
4-2-8. Cancel Adjustment 4-9

5. SEMICONDUCTOR PIN ASSIGNMENTS

SEMICONDUCTOR INDEX 5-1
DIODE 5-2
TRANSISTOR 5-2
IC 5-3

6. SPARE PARTS

6-1. Notes on Spare Parts 6-1
6-2. Exploded View and List 6-2
Ornamental Panel Block 6-2
Mechanism Deck Block 6-3
6-3. Electrical Parts List 6-4
6-4. Optional Fixtures 6-9

7. OUTLINE OF CIRCUIT DESCRIPTION AND BLOCK DIAGRAMS

7-1. Digital Block 7-2
7-2. Audio Block (AU-242 Board) 7-4
7-2-1. Audio (AU-242 Board) Block Diagram 7-5
7-2-2. Audio Control Signal Table 7-5
7-2-3. Flow Chart of Audio Signal 7-6

8. SCHEMATIC DIAGRAMS

AU-242 8-2
CPU-239 8-4
SW-877 8-5
Frame Wiring 8-6

9. BOARD LAYOUTS

AU-242 9-2
CPU-239 9-4
AH-60 9-4
SW-877 9-6

SONY

3-858-847-11(1)

Educational Recorder

Operation Card

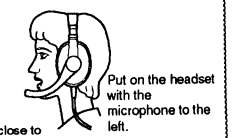
ER-8020

© 1996 by Sony Corporation Printed in Japan

Sign in
Press ATTENDANCE as instructed by your instructor.
The counter display lights and you have signed in. You can not sign out on your recorder. once you have signed in. You can use this button as a CALL button after you have signed in.

Calling the instructor
Press CALL.
The instructor will answer your call. When the instructor's voice is heard, your recorder stops or continues to play (the instructor controls your recorder).

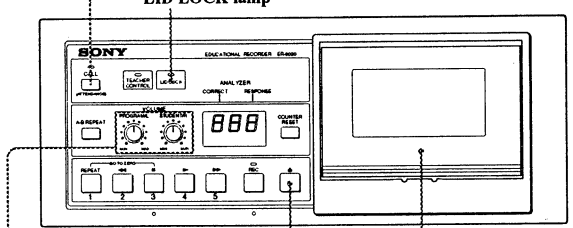
Headset



Position the microphone close to your mouth.

Put on the headset with the microphone to the left.

LID LOCK lamp



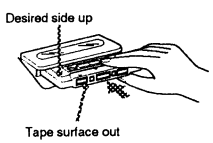
Adjusting the sound volume
Adjust the program with PROGRAM/L VOLUME.
Adjust the student's voice with STUDENT/R VOLUME.

Inserting the cassette tape

1 Press ⏏ to open the lid.

Note
You cannot open the lid when the LID LOCK lamp is lit or if you have not signed in.

2 Insert the cassette.



Note
Be sure to take up any slack in the tape inside the cassette before use.

3 Push the lid down to close.

To eject the inserted cassette
Press ⏏ and remove the cassette.

In library mode
You can study independently.
You can use any tape and control it using the tape control buttons.
For how to control, see "Tape running buttons"
However, in analyzer test mode, you will be assigned to the same group as that of another students and have to sit the test.

SECTION 1
OPERATING INSTRUCTION

This section is extracted from operation manual.

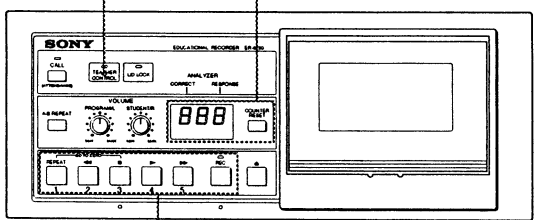
Counter

Press COUNTER RESET to reset the tape counter to 000.
When you are practicing in A-B repeat mode, the counter displays the current tape position while you are holding down COUNTER RESET.

Counter display

In normal operation: 000 to 999
In A-B repeat mode: [-]
When you are a model in model practice: blinks.
In analyzer test:
When you are answering: one of 1 to 5 under RESPONSE according to your pressed button.
When the instructor tells you a correct answer: one of 1 to 5 under CORRECT, corresponding to the correct answer.

TEACHER CONTROL lamp



Tape running buttons

Operation	Press
Repeating a sentence	REPEAT
Rewind	◀◀
Stop	■
Playback	▶
Fast forward	▶▶
Drill recording	REC
Rewind during playback or drill recording	◀◀ (Playback or drill recording starts again when you release the button.)
Fast forward during playback or drill recording	▶▶ (Playback or drill recording starts again when you release the button.)
Letting the tape return to counter position 000	GO TO ZERO (■ + REPEAT) (By pressing ■ and REPEAT simultaneously, the tape is returned to counter position 000. In case, the tape is returned to the point just before the position 000 so that the start of the sentence will not be cut.)

Note
When the TEACHER CONTROL lamp is lit, these operations do not work.

Practicing a particular section repeatedly

1 During a drill or playback, press A-B REPEAT to mark the desired starting position.
In the counter " [- " appears.

2 Press A-B REPEAT again to mark the desired ending position.
In the counter "[-]" appears. The section between the positions marked on steps 1 and 2 will be played back repeatedly 10 times.

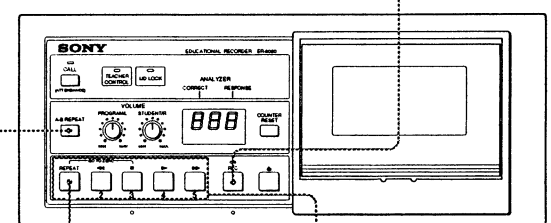
To stop repeat playback.
Press A-B REPEAT again (or ■).

Notes
- If A-B REPEAT is pressed in the middle of the sentence in step 1, playback starts from the beginning of the sentence.
- When there is a more than about 0.7-seconds of silence, the sentence is considered to be ended.
- The break between sentences depends on the length of the silence and the level of the signal recorded on the tape.

Practice with the recorded tape (Drill practice)

Start practice while listening to the program. You can record your practicing voice without erasing the program.
To record your voice
Press REC.

Notes
- When the instructor is controlling your recorder, you may not drill.
- You cannot press REC in conference practice mode.
- Your microphone does not work when the instructor has pressed MIC CUT on the instructor's console. You cannot record your voice.



Listening to the previous sentence again

Press REPEAT during drill or playback.
The recorder starts to rewind until the beginning of the sentence and plays back.

Notes
- When there is a more than about 0.7-seconds of silence, the sentence is considered to be ended.
- The break between sentences depends on the length of the silence and the level of the signal recorded on the tape.
- The recorder may be rewound to your recorded voice in stead of the beginning of the sentence if you press REPEAT during drill practice.

In analyzer test mode

During an analyzer test, use the tape control buttons as response buttons. You cannot use them as tape control buttons.

1 Listen to the question as instructed.

2 Press one of buttons 1 to 5 corresponding to what you think is the correct answer when the counter display under RESPONSE blinks in the counter.
When the counter display under RESPONSE lights, you cannot enter an answer because the response time is exceeded.

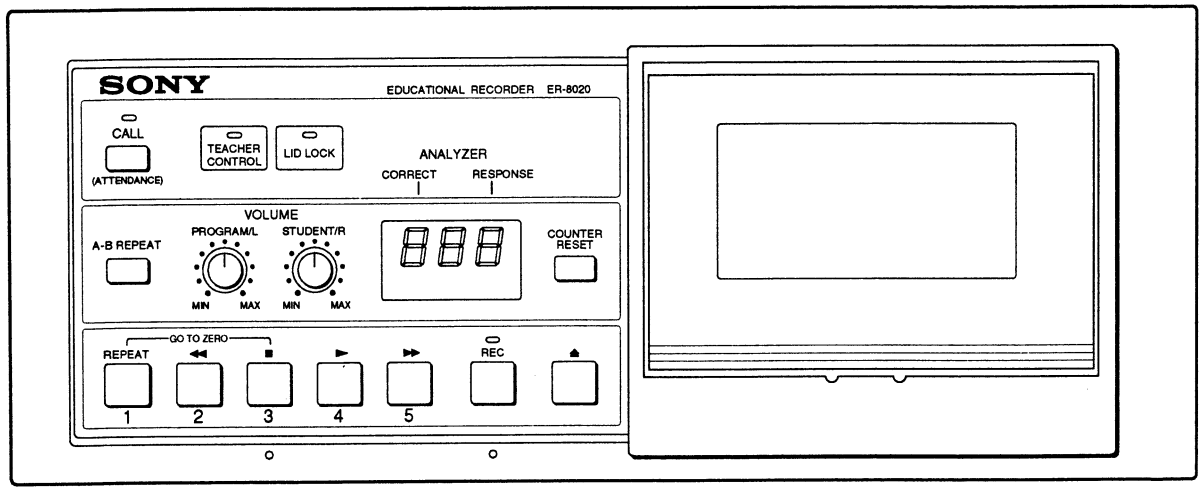
3 After responding, the correct answer appears under the CORRECT display in the counter when the instructor sends the correct answer from the console.

SECTION 2
SERVICE OVERVIEW

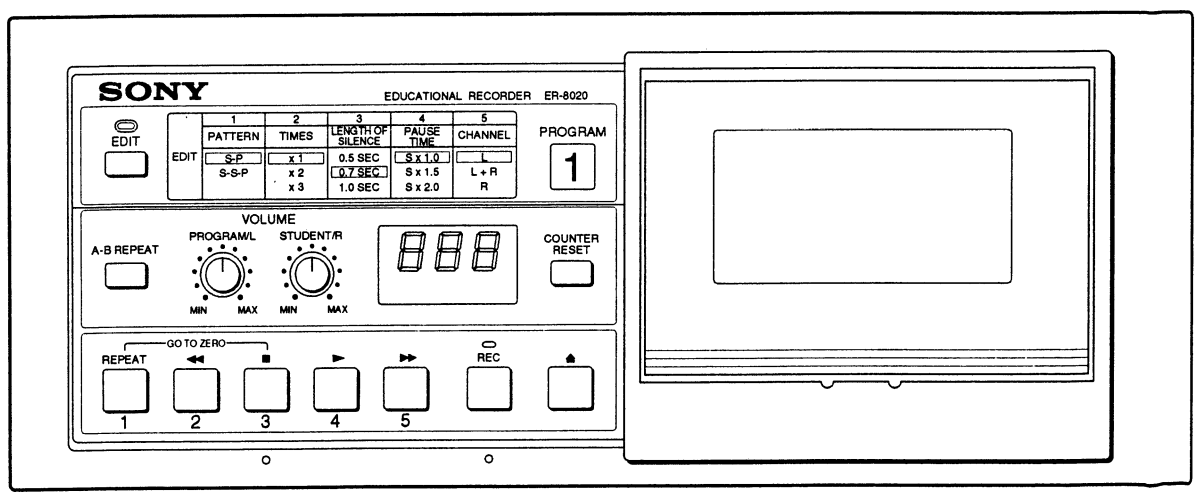
2-1. NOTES ON MASTER RECORDER/STUDENT RECORDER

A seal for a master recorder is included in a packing materials of LLC-8000.
ER-8020 is used as a master recorder, when the seal is attached to it on work.

• Student Recorder



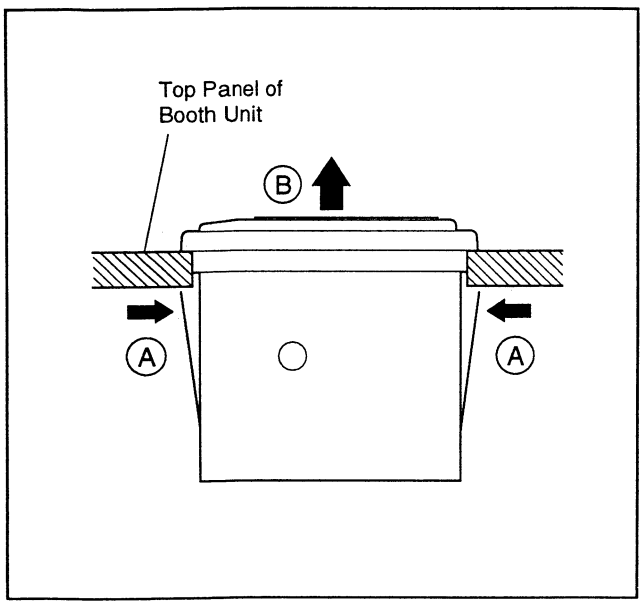
• Master Recorder



NOTE: The ER-8020 works as a master recorder only when connecting to connectors, MTC-1 to MTC-4 in the LLC-8000.
When the ER-8020 is connected to the connectors 1 to 64 of booth recorder in the LLC-8000 or when the ER-8020 is used with a power supply, it can be used as a student recorder.

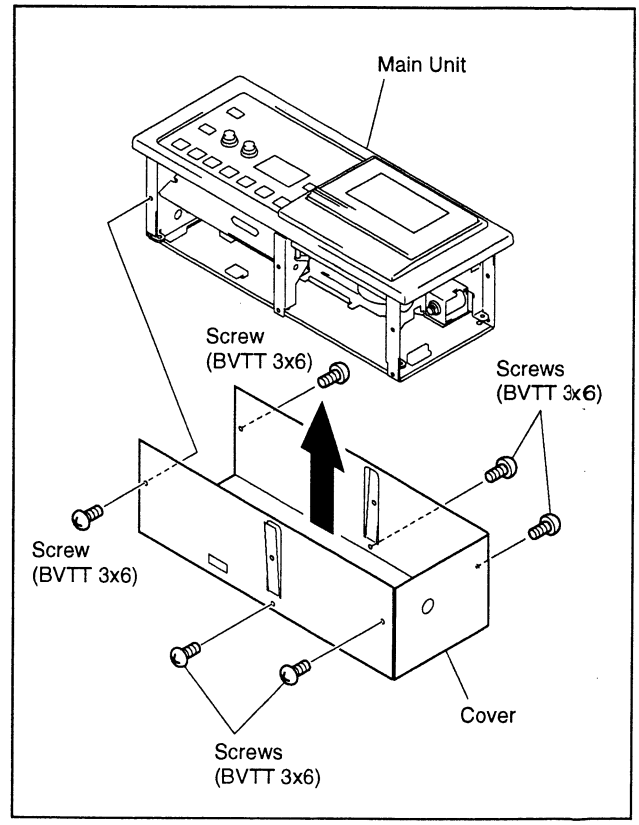
2-2. REMOVAL OF ER-8020 FROM BOOTH UNIT

Push up the unit in the direction of B and remove it while pressing the four fixing pawls in the direction of A as shown in the figure.



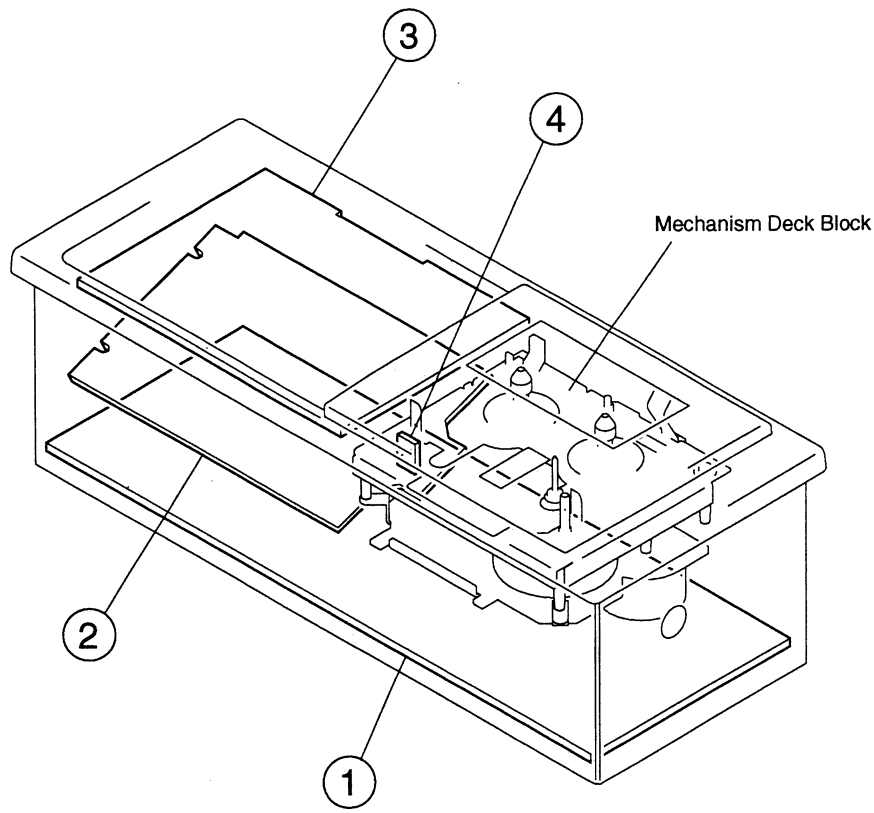
2-3. REMOVAL/INSTALLATION OF CABINET

Unscrew the six screws (BVTT 3×6) and remove the unit in the direction of the arrow. When installing the unit, follow the removal steps in reverse.



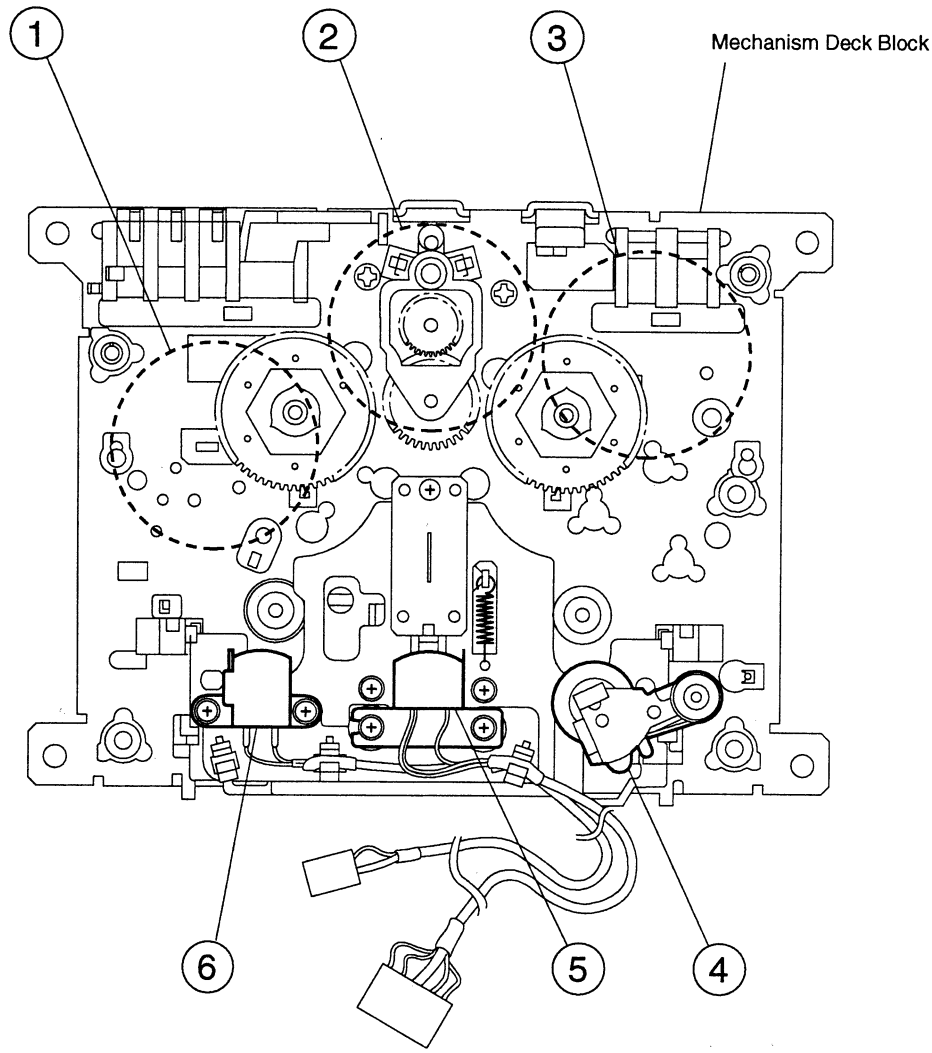
2-4. LOCATION OF MAIN PARTS

2-4-1. Location of Printed Circuit Boards



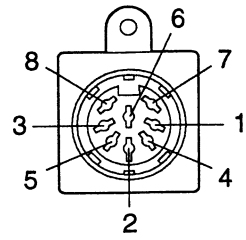
① AU-242 Board : Power Supply & Audio
② CPU-239 Board : CPU
③ SW-877 Board : Switch & Display
④ AH-60 Board : Erase Head

2-4-2. Location of Main Mechanism Parts



① Capstan motor block
② Reel motor block
③ Assist motor block
④ Pinch roller
⑤ Record/playback head
⑥ Erase head

2-5. CONNECTOR SPECIFICATION



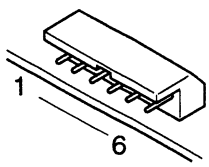
DIN 8P (type b)

Pin No.	Signal name	Function/Specification	Input/Output
1	P. GND	GND for +15 V	———
2	A. GND	GND for Audio	———
3	PGM	−10 dB	Input
4	D. SIG	Digital Signal 2400 bps	Input/Output
5	MONI	−10 dB	Output
6	COLD	GND for D. SIG	———
7	+15 V	+15 V D.C Power	Input
8	INCOM	−10 dB	Input

0 dB = 0.775 Vrms

NOTE:

• The above table is available when the ER-8020 is used singly.



ILG Connector 6P

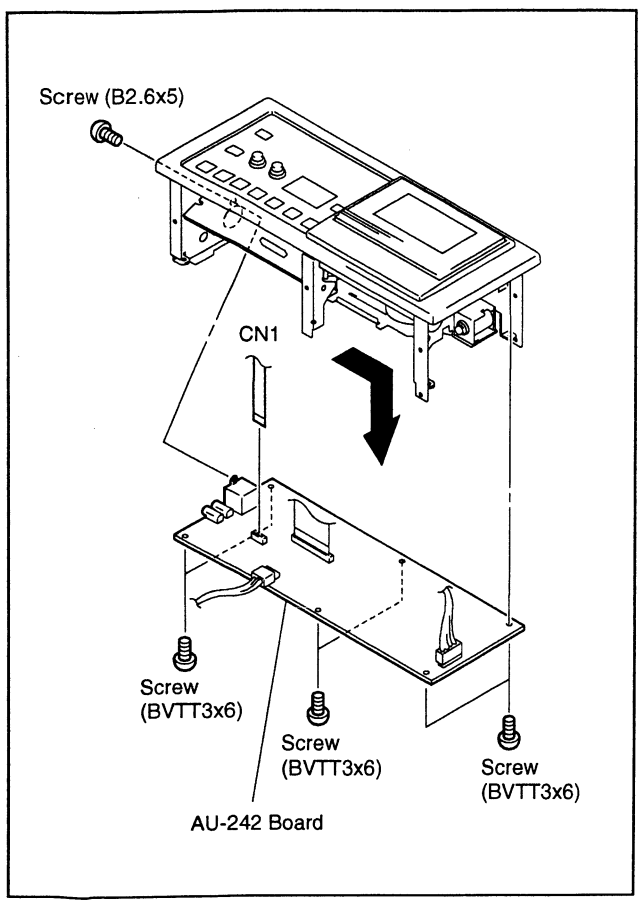
Pin No.	Signal name	Function/Specification	Input/Output
1	AUX L IN	−10 dB	Input
2	AUX R IN	−10 dB	Input
3	A. GND	GND for Audio	———
4	AUX L OUT	−10 dB	Output
5	AUX R OUT	−10 dB	Output
6	A. GND	GND for Audio	———

0 dB = 0.775 Vrms

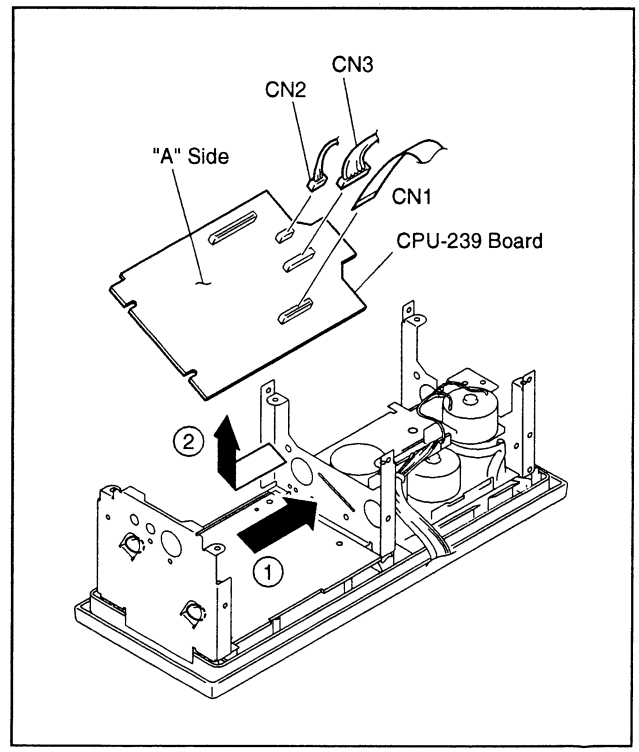
2-6. REMOVAL/INSTALLATION OF CPU-239 BOARD

NOTE: Be sure to read section 2-12-3. Removal/ Installation of Flexible Card Wire (7P, 27P, 16P) and remove/install as directed.

1. Remove the cover. (Refer to section 2-3. Removal/ Installation of Cabinet.)
2. Unscrew the one screw (B 2.6×5) and the six screws (BVTT 3×6) as shown in the figure. Remove the AU-242 board in the direction of the arrow.
3. Pull out a flexible card wire from connector (CN1) on the AU-242 board.



4. Disconnect two connectors (CN2 and CN3) on the CPU-239 board and pull out a flexible card wire from connector (CN1) on the CPU-239 board.
5. Loosen two screws (BVTT 3×6). Slide the CPU-239 board in the direction of the arrows as shown in the figure.

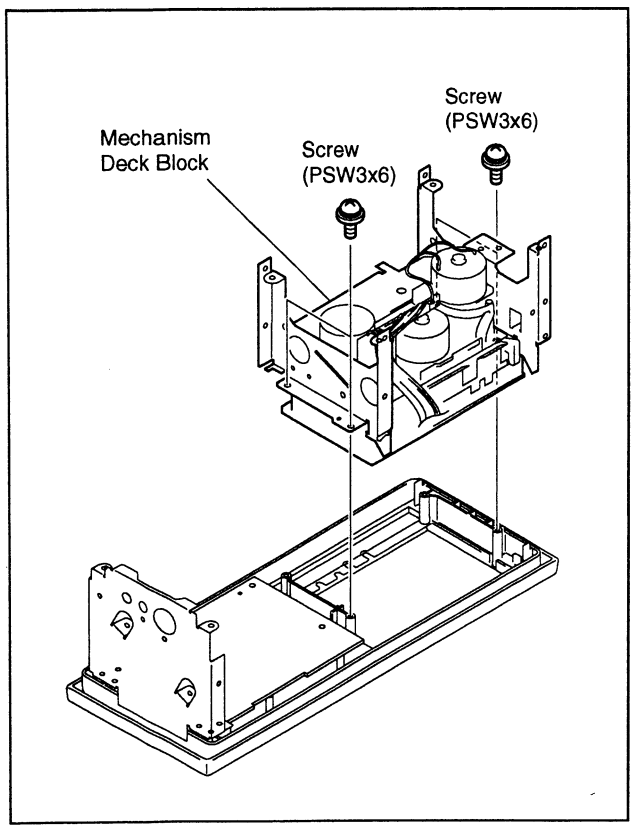


6. Install the CPU-239 board, following the removal steps in reverse.

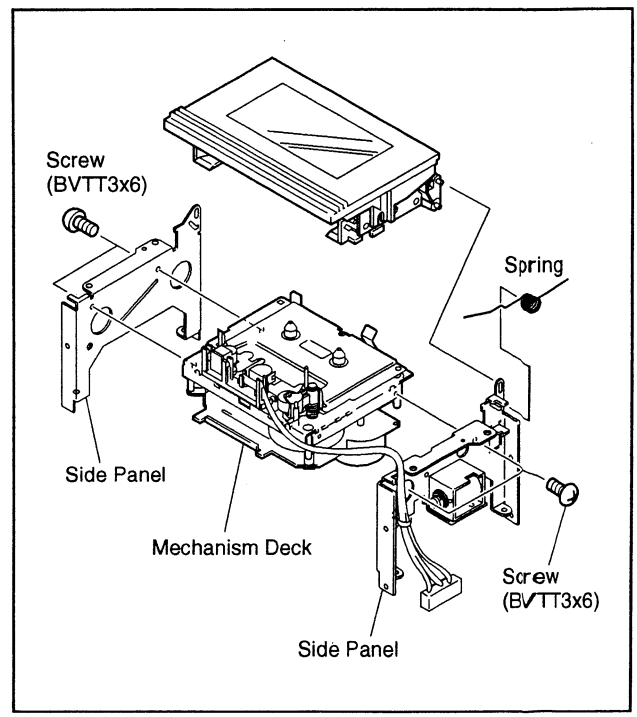
NOTE: Install the CPU-239 board so that A side of the CPU-239 board is top.

2-7. REMOVAL OF MECHANISM DECK

1. Remove the cover. (Refer to section 2-3. Removal/ Installation of cabinet.)
2. Remove the CPU-239 board. (Refer to section 2-6. Removal/Installation of CPU-239 board.)
3. Unscrew four screws (PSW 3×6) and remove the mechanism deck including both side panels.



4. Remove one spring and unscrew four screws (BVTT 3×6) and then remove the mechanism deck from the side panels as shown in the figure.

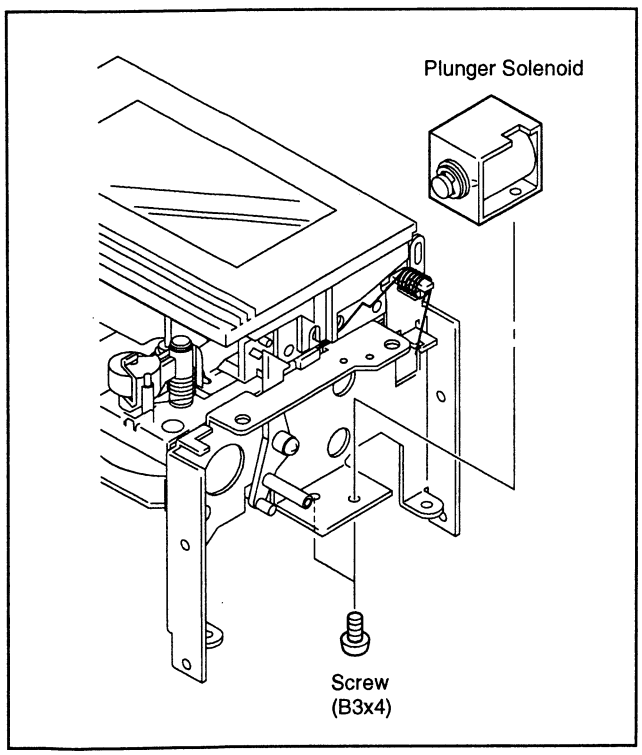


2-8. REPLACEMENT OF MAIN PARTS

2-8-1. Plunger Solenoid Replacement

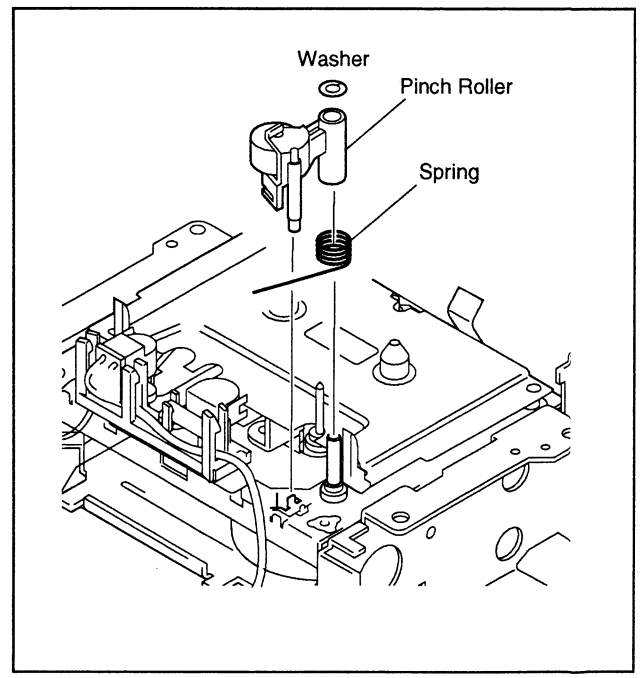
1. Remove the mechanism deck.
   (Refer to section 2-7. Removal of Mechanism Deck.)
2. Unscrew two screws (B3×4) and remove the plunger solenoid.

NOTE: Be sure to read section 4-1-1. EJECT plunger position adjustment and replacement a new one.



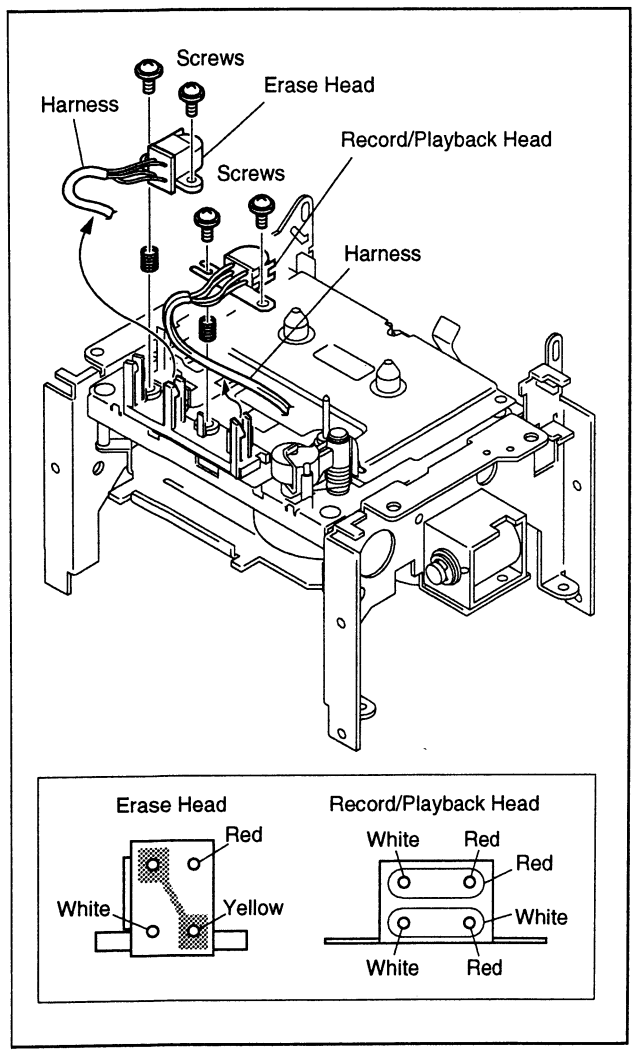
2-8-2. Pinch Roller Replacement

1. Remove the mechanism deck. (Refer to steps 1 through 3 in section 2-7. Removal of Mechanism Deck.)
2. Remove the pinch roller (including spring) after removing the washer.



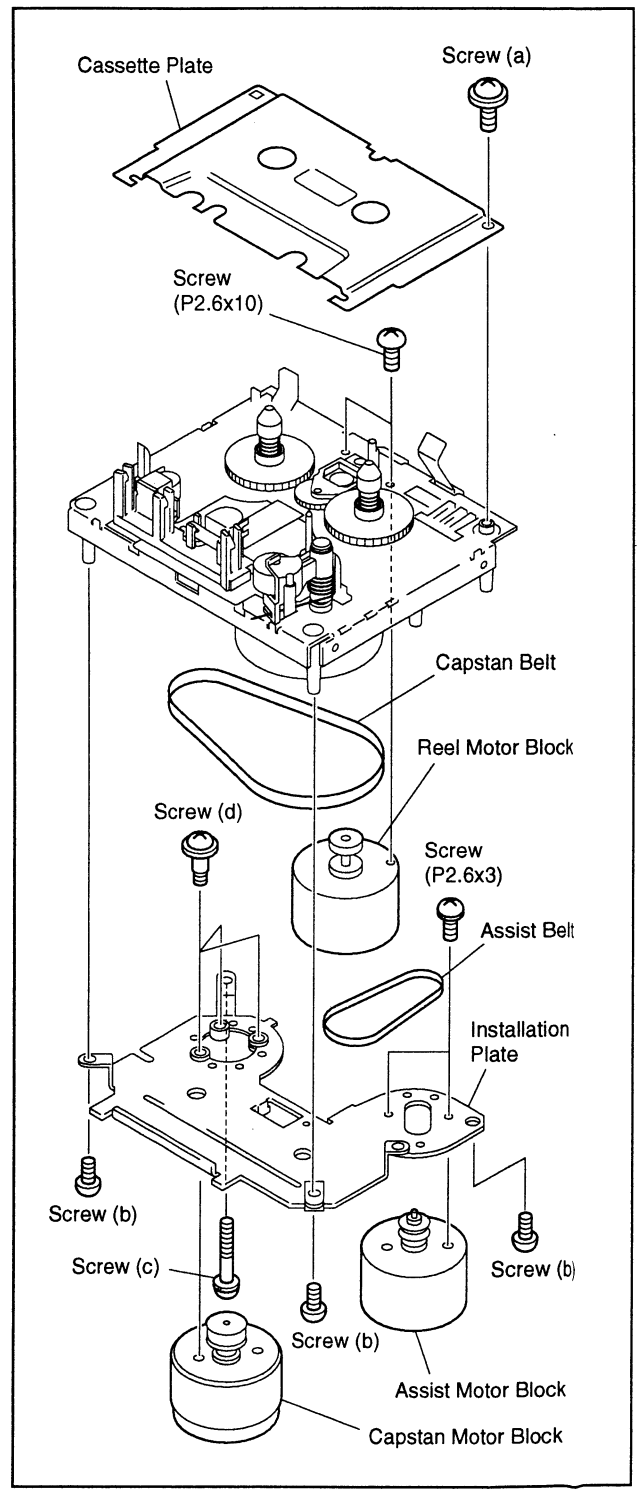
2-8-3. Erase and Record/Playback Heads Replacement

1. Remove the mechanism deck. (Refer to steps 1 through 3 in section 2-7. Removal of Mechanism Deck.)
2. Unsolder the harness of head.
3. Remove the erase head or the record/playback head after unscrewing two screws.



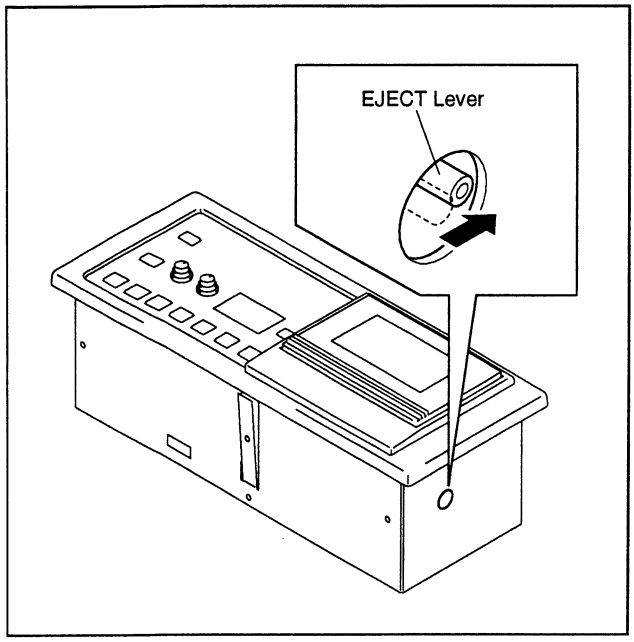
2-8-4. Assist/Capstan/Reel Motors and Assist/Capstan Belts Replacement

1. Remove the mechanism deck. (Refer to step 4 in section 2-7. Removal of Mechanism Deck.)
2. Unscrew one screw (a) and remove the cassette plate.
3. Unscrew three screws (b) and one screw (c) and remove the installation plate.
   (Remove the capstan belt and the assist belt at this time.)
4. Unscrew three screws (d) and remove the capstan motor block.
5. Unscrew two screws (P2.6×3) and remove the assist motor block.
6. Unscrew two screws (P2.6×10) and remove the reel motor block.



2-9. REMOVAL OF A CASSETTE IN THE POWER OFF STATE

ER-8020 can not eject a cassette in the power off state (ATTENDANCE OFF).
When removing the cassette in the power off state, move the EJECT lever as shown in the figure below.



2-10. NOTE ON SUFFIX CHANGE

2-10-1. When Used as Master Recorder on AU-242 Boards Having Suffix Number 11

The tape L channel playback signal normally comes into the audio detection circuit of the IC11 on the AU-242 boards having a suffix number of 11. Therefore, the repeat function and the PME function respond to both R and L channels even when the teacher sets the playback mode to only the R channel when using it as the master TC.
To adjust the playback mode to the repeat function, etc., connect the AU-242 board Q22 base to the part where the foil pattern is cut between pins CN4 and CN21.
(Connect the Q22 base to the part between pins CN4 and CN21.)

2-10-2. CPU-239 Boards Having Suffix Number 12

Those CPU-239 board having a suffix number of 12 do not operate when the version of the CPU is 1.01.
To operate CPU-239 boards having a suffix number of 12, short C22 on the boards or use a CPU of version 1.02 or more.

		CPU Version	
		1.01	1.02 or more
CPU-239 Board suffix number	11	O	O
	12	×	O

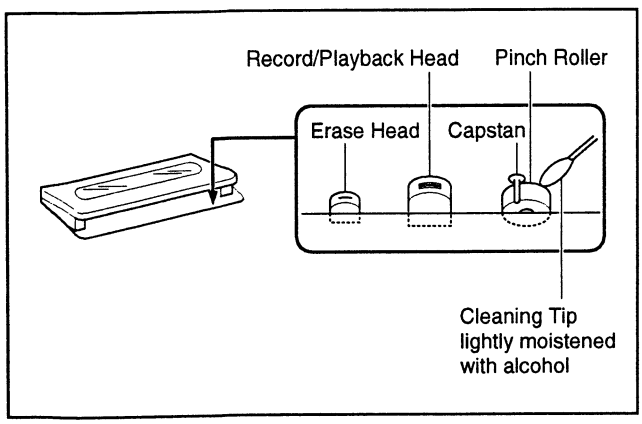
2-11. HOW TO CLEANING

2-11-1. Cleaning the Cabinet

Clean the cabinet and panels by wiping with a soft, dry cloth. For severe stains, moisten the cloth with a small amount of neutral solvent, and finish by wiping with a dry cloth. Do not use alcohol, benzine, thinners or volatile liqids, as these may discolor or damage the cabinet surface.

2-11-2. Cleaning the Heads

Keeping the tape heads in a clean condition is essential to the proper operation of the ER-8020. The accumulation of dust and tape oxides on the heads will result in sound drop-outs, a loss of high frequency response and excessive tape wear.



1. Turn on the power of the ER-8020 tape recorders. To turn on the master recorders, press the POWER switch of the LLC-8000. They are automatically turned on.
   To turn on the student recorders, press the ATTENDANCE button on the student recorder after the LLC-8000 power is switched on.

2. Press the EJECT button to open the cassette holder lid. Remove the cassette, if present.

3. Press both A-B REPEAT button and COUNTER RESET button and hold them down.
   The heads come forward and the capstan and pinch roller rotate. You can now access them easily.

4. When the heads come forward, release either the A-B REPEAT button or the COUNTER RESET button.
   The head section remains with either of the two buttons held down.

5. Moisten a cotton swab or soft cloth with a denatured alcohol, and gently wipe the heads, capstan, and pinch roller over which the tape travels. Avoid catching the cotton between the pinch roller and capstan.

6. Push the button to release it.
   The head section is returned to its original position, and the capstan and pinch roller stop rotating.

7. Close the cassette holder lid.

Do not operate the recorders for about three minutes until alcohol left on the head is evaporated.

2-12. NOTES ON SPARE PARTS

2-12-1. Notes on Spare Parts

(1) Safety Related Components Warning
Components marked with ⚠ on the schematic diagrams, exploded views and electrical spare parts list are critical to safe operation.
Replace these components with Sony parts whose part numbers appear in this manual or in service bulletins and service manual supplements published by Sony.

(2) Standardization of Parts
Spare parts supplied from Sony Parts Center may not always be identical with the parts actually in use due to accommodating the improved parts and/or engineering changes or standardization of genuine parts.
This manual's exploded views and electrical spare parts list indicate the part numbers of the standardized genuine parts at present.

(3) Stock of Part
Parts marked with "o" in the SP(Supply code)column of the spare parts list are not normally required for routine service work. Orders for parts marked with "o" will be processed, but allow for additional time for delivery.

(4) Units for Capacitors, Inductors and Resistors
The following units may be assumed in schematic diagrams, electrical parts list and exploded views unless otherwise specified.

Capacitor: μ F
Inductor : μ H
Resistor : Ω

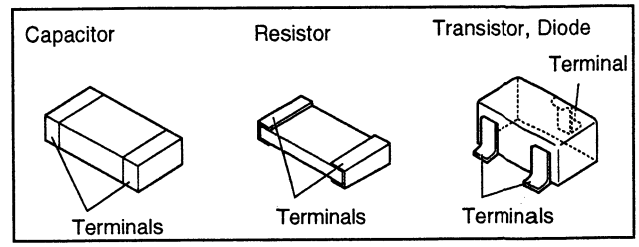
2-12-2. Replacement of Chip Parts

Required Tools

Soldering iron : 20W
If possible, use a soldering-iron tip heatcontroller set to 270 ± 10°C.
Braided wire : Solder Taul or equivalent
Sony part No. 7-641-300-81
Solder : 0.6mm dia. is recommended.
Tweezers

Soldering Conditions

Soldering iron temperature : 270 ± 10°C
Soldering time : Less than 2 seconds per pin



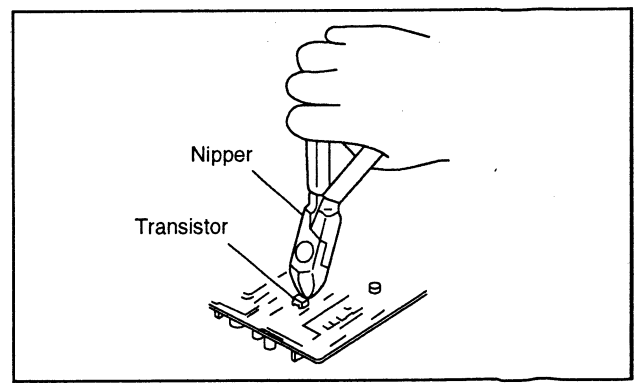
Replacement of Resistor and Capacitor

1. Place the soldering-iron tip onto the chip part and heat it up until the solder is melted. When the solder is melted, slide the chip part aside.
2. Make sure that there is no pattern peeling, damage and/or bridge around the desoldering position.
3. After removing the chip part, presolder the area, in which the new chip part is to be placed, with a thin layer of solder.
4. Place new chip part in the desired position and solder both ends.

NOTE Do not use a chip part again once it has been removed.

Replacement of Transistors and Diodes

1. Cut the terminals of the chip part with nippers.
2. Remove the cut leads with soldering iron as above.
3. Make sure that there is no pattern peeling, damage and/or bridge around the desoldering positions.
4. After removing the chip part, presolder the area, in which the new chip part is to be placed, with a thin layer of solder.
5. Place new chip part in the desired position and solder the terminals.



Replacement of ICs

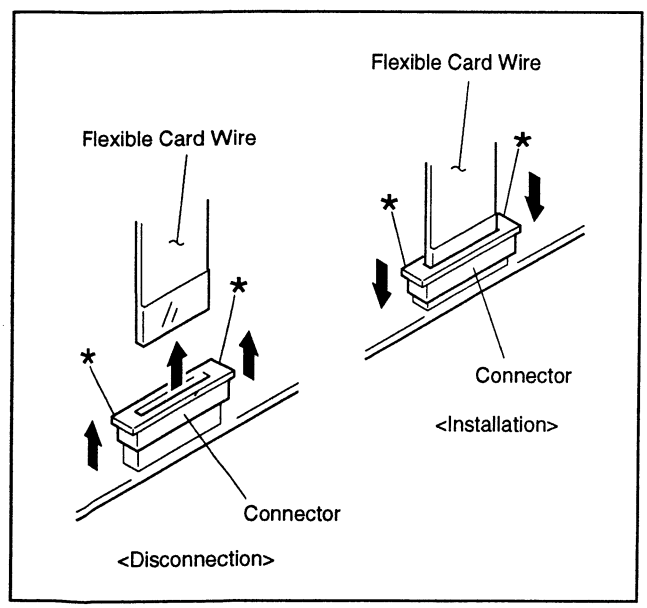
1. Using the braided wire, "SOLDER TAUL" (Sony Part No. 7-641-300-81), remove the solder around the pins of the IC-chip to be removed.
2. While heating up the pins, remove the pins one by one using sharp-pointed tweezers.
3. Make sure that there is no pattern peeling, damage and/or bridge around the desoldering position.
4. After removing the chip part, presolder the area, in which the new chip part is to be placed, with a thin layer of solder.
5. Place new chip part in the desired position and solder the pins.

2-12-3. Removal/Installation of Flexible Card Wire (7P, 27P, 16P)

7P flexible card wire is used on between the AU-242 board and the SW-877 board.
27P flexible card wire is used on between the AU-242 board and the CPU-239 board. 16P flexible card wire is used on between the CPU-239 board and the SW-877 board. When handling a flexible card wire, be very careful not to bend it because this will markedly reduce its life.

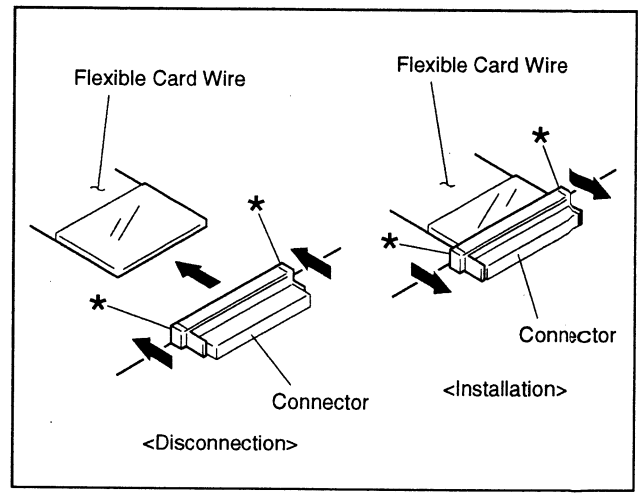
<Straight Type>

- Disconnecting procedure
  Pull up the * marked portions of connector, and then pull out the flexible card wire from the connector.
- Installing procedure
  Install the flexible card wire as far as it will go (up the line indicated on the flexible card wire), and then push down the * marked portions of connector.

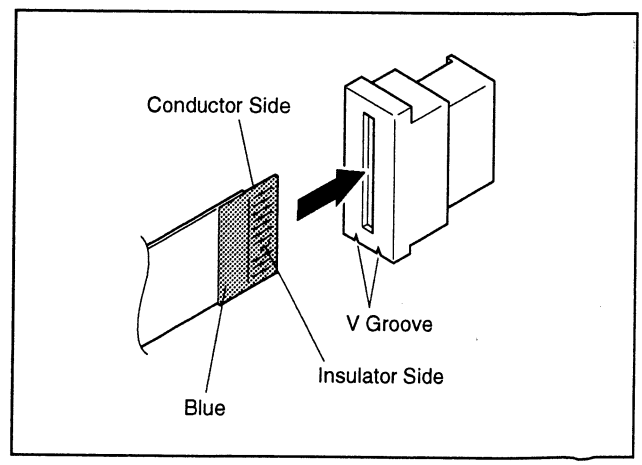


<Angle Type>

- Disconnecting procedure
  Slide * marked portions of connector in the direction of the arrow, and then pull out the flexible card wire from the connector.
- Installing procedure
  Insert the flexible card wire so that is conductor side is facing the printed circuit board, and insert it as far as it will go (up to the line indicated on the flexible card wire). Then slide the * marked portions of connector in the direction of the arrow to lock.



NOTE: The flexible card wire consists of conductor side and insulator side. The flexible card wire must be inserted with the conductor side facing the correct way. If it is not the circuit will not work.



SECTION 3
DIAGNOSIS

3-1. ERROR CODE

When a failure in the mechanism deck occurs, ER-8020 displays an error code as follows:

Error code	Problems	Remedies
E01	doesn't operate normally.	Please check the following items: 1. Check whether the cassette tape is set to the proper position. →When the cassette tape is not set to the proper position and E01 is displayed on COUNTER, eject the cassette and reinsert it to work. 2. Check whether the cable between the mechanism deck and CN3 on the CPU-239 board is connected properly. 3. Check the switches, MD SW1 and MD SW2 in the MD Assy. 4. Check whether the assist motor works properly.
E02	doesn't initialize a cassette tape as the power is turned on.	

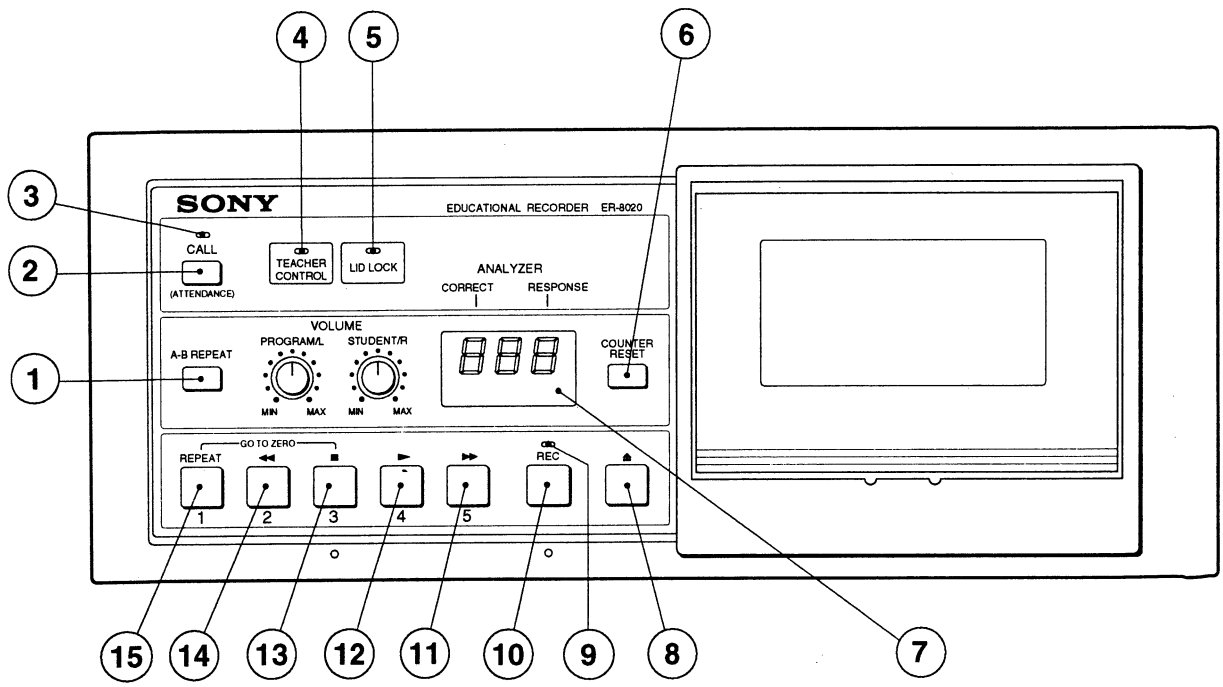


Fig.1 LEDs and Buttons

① A-B REPEAT button
② CALL / EDIT button
③ CALL LED
④ THEACHER CONTROL LED
⑤ LID LOCK LED
⑥ COUNTER RESET button
⑦ Counter
⑧ EJECT button
⑨ REC LED
⑩ REC button
⑪ FF button
⑫ PLAY button
⑬ STOP button
⑭ REW button
⑮ REPEAT button

3-2. SPECIAL MODE

In the special mode, ER-8020 can work without a cassette tape. It corresponds to the safety lug with a cassette inserted.

NOTE: The special mode is not entered when the ER-8020 is connected to connectors, MTC-1 to MTC-4 in the LLC-8000. Connect to the connectors 1 to 64 of booth recorder in the LLC-8000.

3-2-1. Operation

[To start up the special mode, perform the following procedure.]

1. Press the CALL/EDIT button while pressing the EJECT button after turning the power off.
   → The version number of ROM (CPU) on COUNTER is blinking.
   (When connecting to the LLC-8000, 000 on COUNTER may be displayed.)
2. Press the A-B REPEAT button within three seconds (while the version number is blinking) after pressing the CALL/EDIT button.

[To exit the special mode]

1. Press the CALL/EDIT button.
   →The power is turned off.

3-2-2. Function

Press the following keys in the special mode.

Function	Push-button control	Remarks
1. Drill recording	REC *1	The REC LED lights. (Refer to " DRILL " in section 7-2-2. Audio Control Signal Table.)
2. Recording	REC + PLAY	The REC LED blinks. (Refer to " REC+PLAY " in section 7-2-2. Audio Control Signal Table.)
3. Recording in double speed	A-B REPEAT + REC	The TEACHER CONTROL and REC LEDs blink. (Refer to " X2 REC " in section 7-2-2. Audio Control Signal Table.)
4. Playback in double speed	A-B REPEAT + PLAY	The TEACHER CONTROL LED blinks.
5. Selecting L or R channel of tape	A-B REPEAT + EJECT *2	(see inner table)
6. Using as a master recorder	A-B REPEAT + CALL / EDIT *3 *4 *5	The LID LOCK LED blinks. (Refer to " MTC mode ON " in section 7-2-2. Audio Control Signal Table.)

	COUNTER display	MONI output (CN3 pin-5)	Headphone output (J2 pin-2 and -3)	Refer to Section 7-2-2.
a	LL	L channel	L channel	PLAY (LL mode)
b	RR	R channel	R channel	PLAY (RR mode)
c	LR	L channel	R channel	PLAY (LR mode)
d	Tape Counter	L+R channel	L+R channel	PLAY (L+R mode)

(Example 1) REC : Press the REC button.
(Example 2) REC + xxx : While pressing the REC button, press the xxx button.

*1: This function can not be used when ER-8020 is used as a master recorder.
*2: The display on COUNTER is changed, each time the above buttons are pressed. When you remove your finger from the A-B REPEAT button, the COUNTER returns to the tape counter display. But the L or R channel is held selected.
*3: To exit this mode, press " A-B REPEAT+CALL / EDIT ", then the power is turned off.
*4: Operate when the tape counter (refer to "d" in the table of Function 5. Selecting L or R channel of tape) is displayed on COUNTER.
*5: Refer to " Using as a master recorder " in LLC-8000 operating instructions.

3-3. SERVICE MODE

In the special mode, ER-8020 can work without a cassette tape. It corresponds to the safety lug with a cassette inserted.

NOTE: The special mode is not entered when the ER-8020 is connected to connectors, MTC-1 to MTC-4 in the LLC-8000. Connect to the connectors 1 to 64 of booth recorder in the LLC-8000.

3-3-1. Operation

[To start up the special mode, perform the following procedure.]

1. Press the CALL/EDIT button while pressing the EJECT button after turning the power off.
   →The version number of ROM (CPU) on COUNTER is blinking.
   (When connecting to the LLC-8000, 000 on COUNTER may be displayed.)
2. Press the A-B REPEAT button within three seconds (while the version number is blinking) after the CALL/EDIT button is pressed.

[To exit the special mode, perform the following procedure.]

1. Press the A-B REPEAT button while pressing the COUNTER RESET button.
2. Press the CALL/EDIT button.
   →The power is turned off.

3-3-2. Diagnosis

Press the following keys in the self-diagnosis mode.

<table>
<tr><th>Check item</th><th>Description</th></tr>
<tr><td>STEP 1
LED Illuminaton and button input check</td><td>1. Press the REPEAT button while pressing the COUNTR RESET button.
At that time, - - - is displayed on COUNTER.
2. Release the switch to light all LEDs and COUNTER.
→The 888 on the counter and four LEDs
(CALL, TEACHER CONTROL, LID LOCK and REC) lights.
3. Press the any button to check the button
→The LEDs are turned off.
→The following number is displayed on COUNTER according to pressed button.

<table><tr><th>Button</th><th>COUNTER</th></tr><tr><td>REPEAT</td><td>111</td></tr><tr><td>REW</td><td>222</td></tr><tr><td>STOP</td><td>333</td></tr><tr><td>PLAY</td><td>444</td></tr><tr><td>FF</td><td>555</td></tr><tr><td>REC</td><td>666</td></tr><tr><td>EJECT</td><td>777</td></tr><tr><td>COUNTER REST</td><td>888</td></tr><tr><td>CALL/EDIT</td><td>999</td></tr><tr><td>A-B REPEAT</td><td>000</td></tr></table></td></tr>
<tr><td>STEP 2
Serial Communication Loop Check</td><td>Press the REW button while pressing the COUNTER RESET button.
→This is a loop check as follows:
IC1 pin-3/CPU-239 board
↓
Q13 and Q14/CPU-239 board
↓
D6/CPU-239 board
↓
IC1 pin-1/CPU-239 board
→ OK: The - - - on COUNTER blinks three times.
NG: The - - - on COUNTER flashes.

NOTE: This check is not performed when the ER-8020 is connected to the LLC-8000.</td></tr>
</table>

SECTION 4
ALIGNMENT

4-1. MECHANICAL ADJUSTMENT

4-1-1. EJECT Plunger Position Adjustment

Adjust the plunger position with the two stroke adjustment screws with it pressed on the pole piece in the direction of the arrow in Fig. 1.

[Specification]
A is 0.2 thru 0.8 mm.

NOTE: The claw should be hook on the groove of pole piece as shown in the Fig. 2.

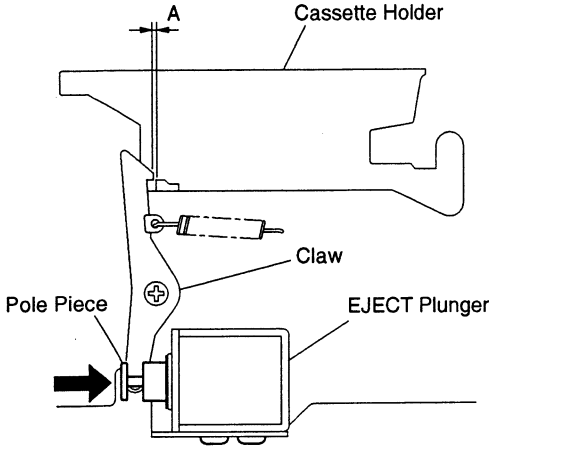


Fig. 1

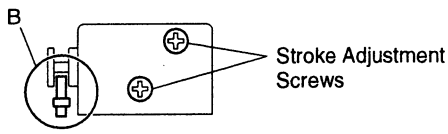


Fig. 2

4-1-2. Head Height Adjustment

1. Insert the test tape CQ-009C and play back.
   Adjust the height adjustment screw of the erase head so that the tape is hold properly to the tape guide as shown in Fig. 2.
2. Press the STOP button.
3. Play back and check the tape running.
   When the tape running does not meet Fig. 2.
   repeat the above step 1 and step 2.
4. Perform the azimuth adjustment.
   (Refer to section 4-2-3. Azimuth Adjustment.)

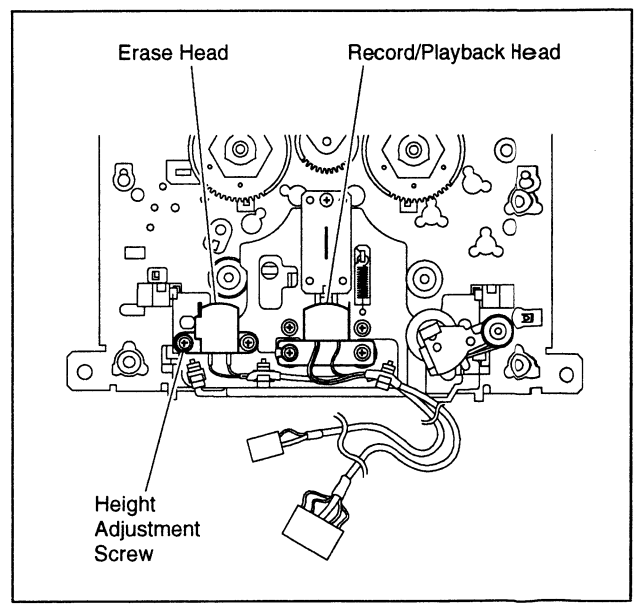


Fig. 1

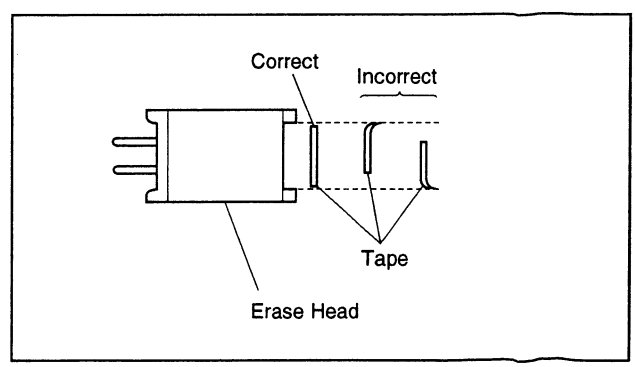


Fig. 2

4-1-3. Mesurement

It is not necessary to adjust the following items basically. Mesure the following torques so that the following specification meets.

Check item	Specification	Remarks
Play torque	3 to 7 mN·m (30 to 70 g.cm)	CQ-102C
Back tension torque	0.2 to 0.6 mN·m (2 to 6 g.cm)	CQ-102C
FF/REW torque	9.0 to 18 mN·m (90 to 180 g.cm)	CQ-201B
FF/REW time	110 seconds or less	C-60
Wow & flutter	0.08% (WRMS)	WS-48A

NOTE: Check the IC6 on CPU-239 board or the motor etc., when the following specification does not meet.

4-2. ELECTRICAL ADJUSTMENT

4-2-1. Preparation Before Electrical Adjustment

[Caution]

1. When the cover of ER-8020 is removed, lay a shielding board beneath the ER-8020 (as shown in the Fig. 1) or slant the ER-8020 by 90 degrees (as shown in the Fig. 2) when measuring a small signal such as S/N and distortion measurement in order to protect the AU-242 board from noise.
2. When the screw ① in Fig. 2 is removed, connect the cord of the mechanism deck to GND. (② shown in Fig. 2) to prevent the audio system from noise.

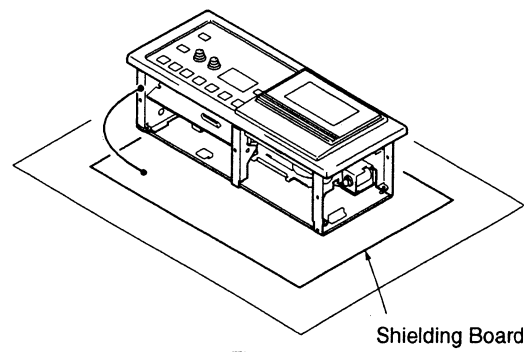


Fig. 1

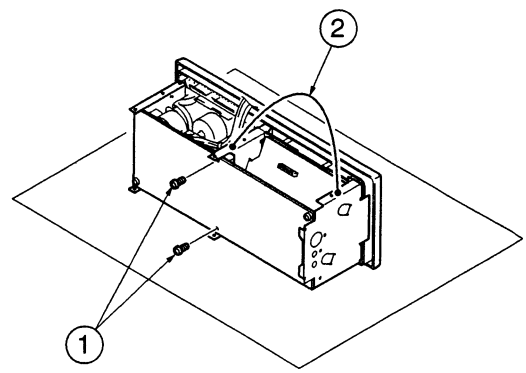


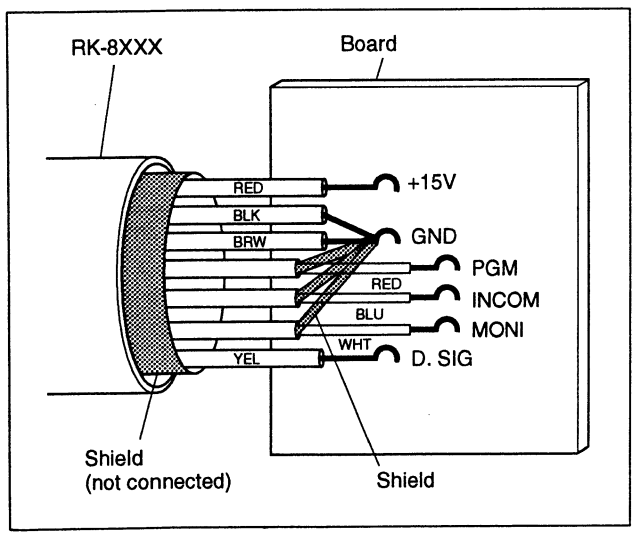
Fig. 2

1. Short pins-1, 2 and 6 of CN3 on the AU-242 board. (Return to the original state by removing the short before connecting back to LLC-8000.)

2. Connect pins-1, 2 and 6 of CN3 on the AU-242 board to GND, Supply +15 V to the CN3 pin-7.

NOTE: Be sure to turn off the main power only when the mechanism deck has already been set in stop state. If the main power is turned off while the mechanism deck is operating, trouble may occur due to the load on the mechanical parts.

It is convenient if the tool shown below can be manufactured by modifying RK-8XXX.



3. 2 seconds later after turning the power on, press the CALL / EDIT button while pressing the EJECT button.

4. COUNTER flashes for three seconds. Press the A-B REPEAT button while COUNTER is flashing. Version of the software appears on COUNTER. If version of the software does not appear on COUNTER, it means that the system has not entered into the special mode. Press the CALL / EDIT button to return to the standby state (COUNTER is turned off in standby) and repeat the above step 3 and step 4.

4-2-2. Description of Special Operation

Refer to section 3-2. Special Mode

1. If the machine is started up in the special mode the machine can enter the modes such as playback, record and FF even though a tape is not inserted. (The REW mode shuts off when a tape is not inserted.) The machine does not enter the record or DRILL mode when the record-prohibited tape such as a test tape (mis-recording prevention tab is broken) is used.

2. Either L or R channel can be selected for playback.

   (1) How to select L or R channel in the special mode
   The COUNTER display changes follows enabling to select the desired channel, each time pressing the eject button while pressing the A-B REPEAT button. (When you remove your finger from the A-B REPEAT button, the COUNTER returns to the tape counter display. But the L or R channel is held selected. The following display appears for two seconds after playback starts.)

COUNTER display	CN3 pin-5 MONI output	J2 pin-2and -3 headphone output
L L	L channel	L channel
R R	R channel	R channel
L R	L channel	R channel
Tape counter	L + R channel	L + R channel

3. Double speed recording or playback is possible.

   Press the REC button or the PLAY button while pressing the A-B REPEAT button. The TEACHER CONTROL LED flashes during the double-speed operation.

   NOTE: The double speed recording is not possible in the R channel.

4. The console can be set as a master recorder. Press the CALL button while pressing the A-B REPEAT button. The ER-8020 enters the MTC* mode and the LID LOCK LED flashes. The unique functions of the MTC such EDIT (also SP, SSP etc.,) which are available only with the master recorder can be checked.

* Refer to " Using as a master recorder " in LLC-8000 operating instructions.

4-2-3. Azimuth Adjustment

[Measuring equipment]
Level meter (2 channels) or oscilloscope
Test tape P-4-A100-2 (10 KHz/-20 dB)

[Specification]
Maximum output

1. Set the VOLUME knobs "PROGRAM/L" and "STUDENT/R" to their mechanical center.
2. Connect channel-1 input of a level meter to the MONI output. (Connect CN3 pin-5 and GND. [GND is CN3 pin-2]). Connect channel-2 input of a level meter to the headset output (between J2 pin-2 and GND. [GND is J2 pin-1]). Alternately, connect channel-1 and channel-2 inputs of an oscilloscope to the above pins. (Range: Approximately AC 20 to 50 mV/div.)
3. Start up the special mode. (Refer to section 3-2. Special Mode.)
4. Set the playback mode to LR. (Press the EJECT button several times while pressing the A-B REPEAT button so that L R is displayed on COUNTER.) (Refer to section 3-2. Special Mode.)
5. Playback the test tape P-4-A100-2.
6. Adjust the head azimuth adjustment screw so that the level meter shows the maximum value. When peak of channel-1 is found in different screw position that the peak of channel-2, set the head azimuth adjustment screw to the center between two peak positions. When an oscilloscope is used, adjust the head azimuth so that the Lissajous's figure is maximumed and the Lissajous's figure of channel-1 and channel-2 are displayed on an oscilloscope within the range shown in Fig. 2.

   NOTE: Note that the Lissajous's figure of channel-1 and channel-2 are inverted of their phases each other which differ that the normal Lissajous's figure. This phase inversion occurs because numbers of inverting amplifier is different between channel-1 and channel-2 by one stage.

Connection diagram

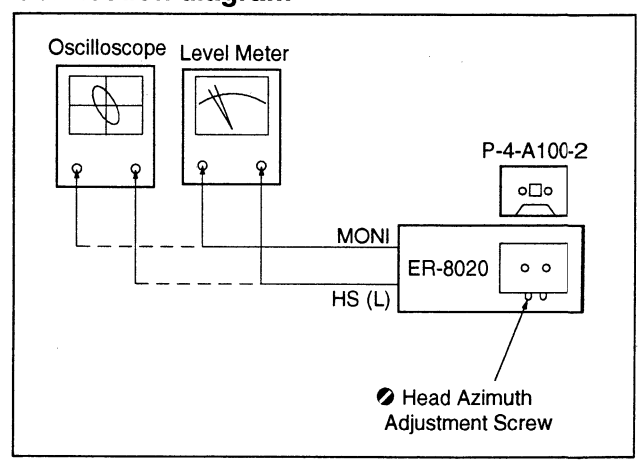


Fig. 1

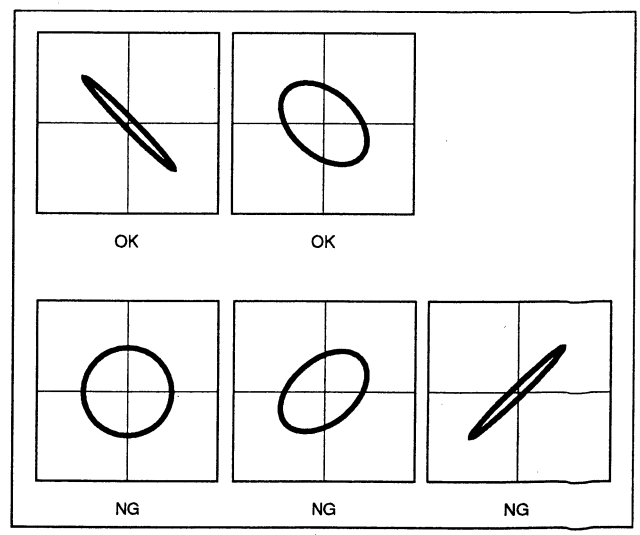


Fig. 2

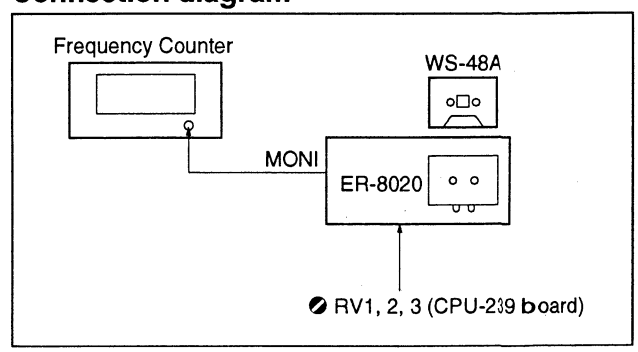
4-2-4. Tape Speed Adjustment

[Measuring equipment]
Frequency counter
Test tape WS-48A (3 KHz)

[Specification]
Double speed: 6020 ± 20 Hz
Standard speed: 3010 ± 20 Hz

1. Connect a frequency counter to the MONI output and GND.
   (Between CN3 pin-5 and GND. [GND is CN3 pin-2]).
2. Start up the special mode.
   (Refer to section 3-2. Special Mode.)
3. Insert the test tape WS-48A.
4. Playback the test tape at the double speed.
   (Press the PLAY button while pressing the A-B REPEAT button to flash TEACHER CONTROL LED and to enter the double speed mode.)
   (Refer to section 3-2. Special Mode.)
5. Adjust RV1 (or RV3) on the CPU-239 board so that frequency is 6020 Hz at tape top.
6. Press the PLAY button to playback the test tape at the standard speed. Adjust RV2 on the CPU-239 board so that the frequency is 3010 Hz at tape top.
7. Turn over the test tape. The frequency should be within the above specification even at tape end.

Connection diagram



4-2-5. Playback Level Adjustment

[Measuring equipment]
Level meter
Test tape P-4-L300 (315 KHz/0 dB)

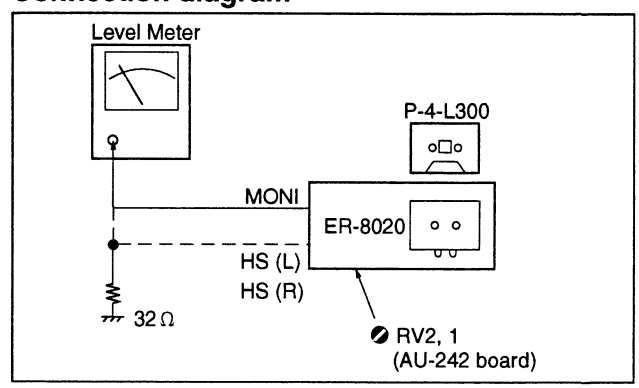
[Specification]
MONI output : -10 ± 0.5 dB (Standard speed)
: -10 ± 2 dB (Double speed)
Headset output : -19 ± 3 dB (Standard speed)
(When terminated by 32 Ω resister)

1. Connect a level meter to the MONI output.
(CN3 pin-5 and GND. [GND is CN3 pin-2.])
2. Start up the special mode.
(Refer to section 3-2. Special Mode.)
3. Set the playback mode to LL.
(Press the EJECT button several times while pressing the A-B REPEAT button to display L L on COUNTER.)
(Refer to section 3-2. Special Mode.)
4. Insert the test tape P-4-L300 and press the PLAY button.
5. Adjust RV2 on the AU-242 board so that the level meter indicates -10 dB. (Adjustment of L channel playback level.)
6. Confirm that the playback level at double speed satisfies the above specification of (MONI output (at the double speed)). (Press the PLAY button while pressing the A-B REPEAT button to flash TEACHER CONTROL LED and that the machine enters the double speed playback.)
(Refer to section 3-2. Special Mode.)
7. Set the playback mode to RR and perform the above steps 4 to 6. However make adjustment using RV1.
(Adjustment of the R channel playback level.)
(Refer to section 3-2. Special Mode.)

[Perform the following procedure to check the headset output.]

8. Set the VOLUME knobs of "PROGRAM/L" and "STUDENT/R" to their center.
9. Connect a level meter to the headset L channel output (between J2 pin-2 and GND. [GND is J2 pin-1]).
Connect a 32 Ω resister between J2 pin-2 and J2 pin-1.
10. Set the playback mode to RR. Playing the test tape and confirm that the headset L channel output satisfies the above specification. (Refer to section 3-2. Special Mode.)
11. Connect a level meter to the headset R channel output (between J2 pin-3 and [GND is J2 pin-1]).
Connect a 32 Ω resister between J2 pin-3 and J2 pin-1.
12. Set the playback mode to RR. Playback the test tape and confirm that the headset R channel output satisfies the above specification. (Refer to section 3-2. Special Mode.)

Connection diagram



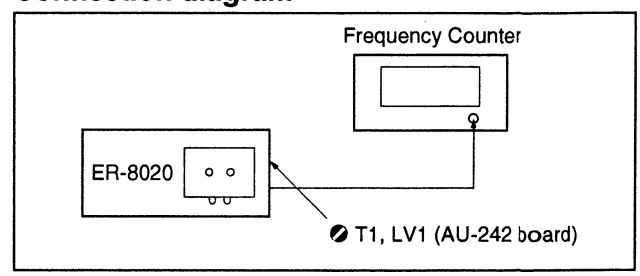
4-2-6. Bias Frequency Adjustment

[Measuring equipment]
Frequency counter

[Specification]
150 ± 5 KHz

1. Connect a frequency counter to CN5 pin-3 and GND on the AU-242 board [GND is CN5 pin-1].
2. Start up the special mode.
   (Refer to section 3-2. Special Mode.)
3. Press the REC and PLAY buttons simultaneously to enter the REC + PLAY mode. (The REC display flashes when the machine enters the REC+ PLAY mode.)
   (Refer to section 3-2. Special Mode.)
4. Adjust T1 on the AU-242 board so that the bias frequency satisfies the above specification.
5. Press the REC switch to enter the DRILL mode.
   (The REC LED lights when the machine enters the DRILL mode.) (Refer to section 3-2. Special Mode.)
6. Adjust LV1 on the AU-242 board so that the bias frequency satisfies the above specification.

Connection diagram



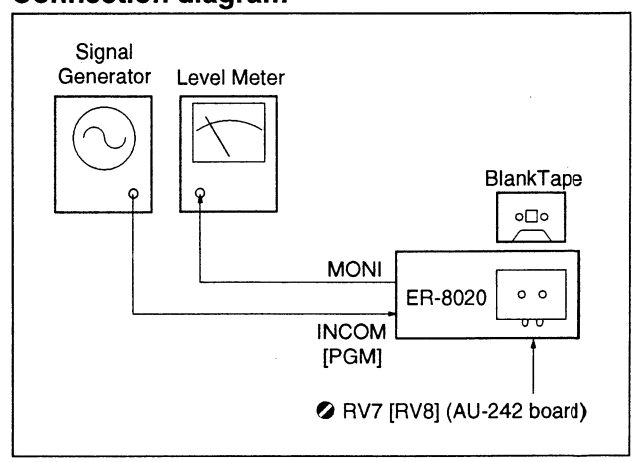
4-2-7. Bias Current Adjustment

[Measuring equipment]
Level meter
Signal generator
Blank tape

[Specification]
Playback level of 10 KHz must stay within the following range with reference to the playback level of 315 Hz :
-6 ± 2 dB

1. Connect a level meter to the MONI output (between CN3 pin-5 and GND [GND is CN3 pin-2]).
2. Connect the signal generator to the INCOM input (between CN3 pin-8 on the AU-242 board and GND [GND is CN3 pin-2]).
3. Start up the special mode and insert the blank tape. (Refer to section 3-2. Special Mode.)
4. Set the playback mode to RR. (Refer to section 3-2. Special Mode.) (Press the EJECT button several times while pressing the A-B REPEAT button to display RR on COUNTER.)
5. Press the REC button and the PLAY button simultaneously to enter the REC + PLAY mode. (Refer to section 3-2. Special Mode.) (The REC LED flashes when the system enters the REC + PLAY mode.)
6. Input 315 Hz/-30 dB and 10 KHz/-30 dB from the signal generator.
7. Playback the signal recorded in step 6 and check that the playback level satisfies the above specification. If the playback level does not satisfy the specification, adjust RV7 on the AU-242 board and repeat adjustment starting from step 5 again.
8. Connect the signal generator to the PGM input (between CN3 pin-3 on the AU-242 board and GND [GND is CN3 pin-2]).
9. Set the playback mode to LL. (Refer to section 3-2. Special Mode.)
10. Repeat adjustment from step 5 to step 7. Make adjustment using RV8.

Connection diagram



4-2-8. Cancel Adjustment

[Measuring equipment]
Level meter
Signal generator
Oscilloscope
(Prepare 6 KHz band-pass filter or low-pass filter of approximately 30 KHz when available.)

[Specification]
MONI output level
Bias leakage : Less than -20 dB (as small as possible)
6 KHz leakage : Less than -30 dB (as small as possible)

1. Connect a level meter to the MONI output (between CN3 pin-5 and GND [GND is CN3 pin-2]).
2. Connect the signal generator to the INCOM input (between CN3 pin-8 on the AU-242 board and GND [GND is CN3 pin-2]).
   Turn off the signal generator down until step 8.
3. Connect channel-1 of an oscilloscope to the MONI output (between CN3 pin-5 and GND [GND is CN3 pin-2]). Connect channel-2 of an oscilloscope to the signal generator. (Range: Approximately 50 to 100 mV AC)
4. Start up the special mode. (Refer to section 3-2. Special Mode.)
5. Press the REC button to enter the DRILL mode. (The REC LED lights when the system enters the DRILL mode.) (Refer to section 3-2. Special Mode.)
6. Adjust CP3 on the AU-242 board until the level meter indicates the "Bias leakage" value as shown the above.
7. When a 6 KHz band-pass filter or low-pass filter of approximately 30 KHz is available, insert it between the MONI output and the level meter.
8. Input 6 KHz/-10 dB signal from the signal generator.
9. Display the Lissajous's waveform on an oscilloscope. Adjust RV5 and RV6 on the AU-242 board until "A" is less than 1/2 of "B" as shown in Fig. 2. When a 6 KHz band-pass filter or low-pass filter of approximately 30 KHz is available, adjust RV5 and RV6 on the AU-242 board until a level meter satisfies the "6 KHz leakage specification".
   If the value does not satisfy the specification, short or open any of SL1, SL2, SL3 or SL4 on the AU-242 board, and adjust RV5 and RV6.

Connection diagram

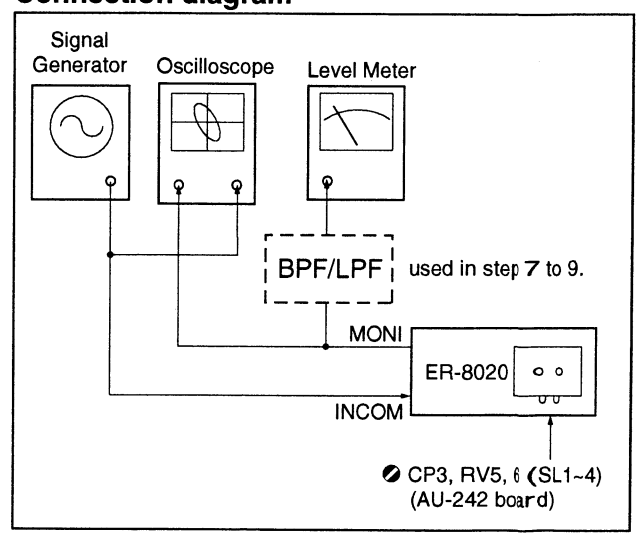


Fig. 1

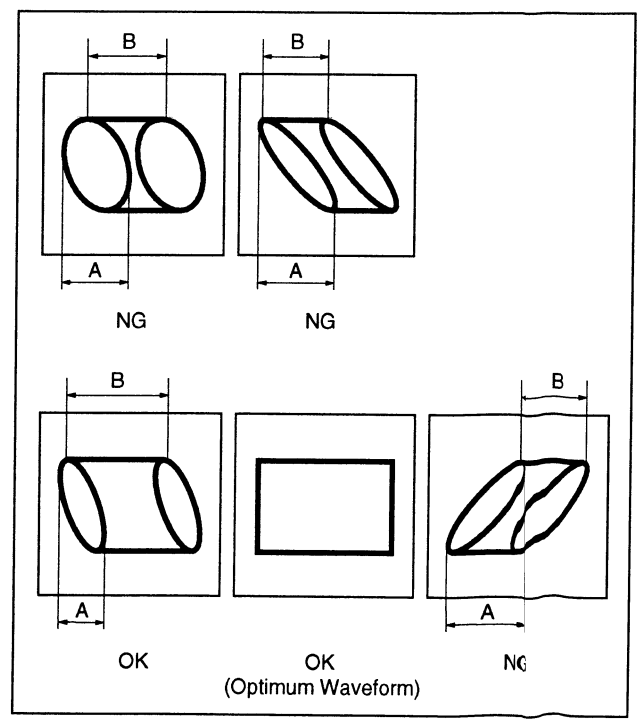


Fig. 2

SECTION 5
SEMICONDUCTOR PIN ASSIGNMENTS

ここに記載されている半導体は，それぞれの機能を等価的に表したものです。 なお，互換性のない型名を併記していることがありますので，部品を交換するときは，Spare Partsの章を参照してください。
等価回路はＩＣメーカーのデータブックに従いました。

Semiconductors of which functions are equivalent are described here. For parts replacement, refer to the section of Spare Parts in this manual. The circuit diagram of each IC is obtained from the IC data book published by the manufacturer.

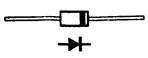
DIODE	Page
10E1N	5-2
10E1N-TA1B	5-2
1S2837-T1	5-2
1SS184	5-2
1SS355	5-2
1SS355TE-17	5-2
GL8HD22	5-2
RD12SB3-T1	5-2
RD3.6SB	5-2
RD3.6SB-T1	5-2
RD4.7SB2	5-2
RD4.7SB2-T1	5-2
RD7.5SB2-T1	5-2
RD9.1SB2-T1	5-2

TRANSISTOR	Page
2SB1123-T	5-2
2SB1123-T-TD	5-2
2SB733-34	5-2
2SB734-T-5	5-2
2SC3112B-TPE2	5-2
2SC3326N-A	5-2
2SC3326N-TE85L-B	5-2
2SD1310-K	5-2
2SD880-GR	5-2
DTA124EKA-T146	5-2
DTC124EKA-T146	5-2
UN2119	5-2
UN2119-TX	5-2

IC	Page
BA6209	5-3
BA7755A	5-3
CXA1498S	5-4
NJM2072M	5-3
NJM4560M	5-3
NJM4560M-TE2	5-3
NJM4580E(TE2)	5-3
NJM7805FA	5-3
NJM78M09FA	5-3
PST994D	5-3
PST994D-T	5-3
SL-1323-20H	5-5
SN74HC138ANS	5-5
SN74HC138ANS-E05	5-5
SN74HC273ANS-E05	5-5
TMP90PH02P	5-6
UPC1330HA-NA	5-5

DIODE, TRANSISTOR

DIODE

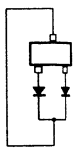


10E1N
10E1N-TA1B

-TOP VIEW-

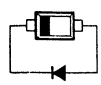
RD3.6SB
RD3.6SB-T1
RD4.7SB2
RD4.7SB2-T1
RD7.5SB2-T1
RD9.1SB2-T1

-TOP VIEW-

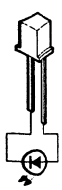


1S2837-T1
1SS184

-TOP VIEW-

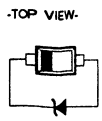


1SS355
1SS355TE-17



GL8HD22 ;RED

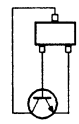
-TOP VIEW-



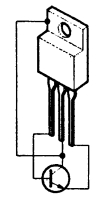
RD12SB3-T1

TRANSISTOR

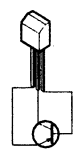
-TOP VIEW-



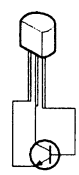
2SB1123-T
2SB1123-T-TD
2SC3326N-A
2SC3326N-TE85L-B



2SD1310-K
2SD880-GR

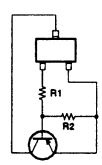


2SB733-34
2SB734-T-5



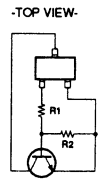
2SC3112B-TPE2

-TOP VIEW-



DTA124EKA-T146
UN2119
UN2119-TX

-TOP VIEW-

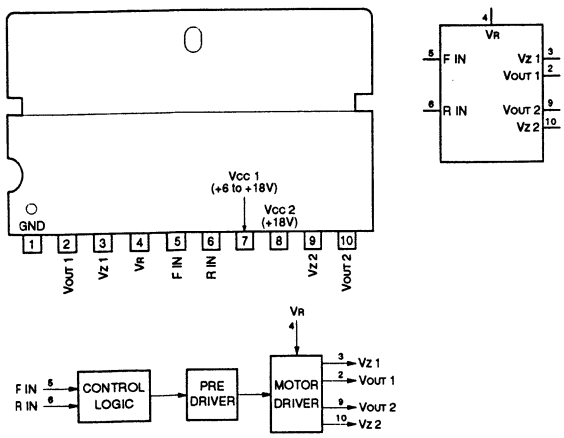


DTC124EKA-T146 (R1,R2=22K)

IC

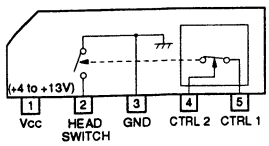
BA6209 (ROHM)

REVERSIBLE MOTOR DRIVER
-SIDE VIEW-



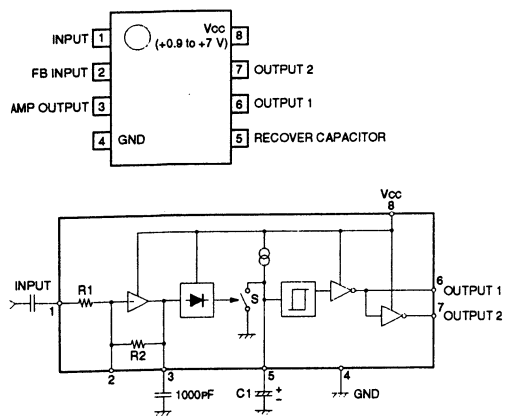
BA7755A (ROHM)

AUDIO HEAD SWITCHER
-SIDE VIEW-



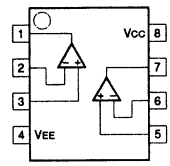
NJM2072M (JRC)

VOICE LEVEL SENSOR
-TOP VIEW-



NJM4560M (JRC)FLAT PACKAGE
NJM4560M-TE2
NJM4580E(TE2) (JRC)FLAT PACKAGE

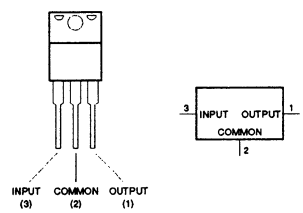
DUAL OPERATIONAL AMPLIFIERS
(DUAL-SUPPLY TYPE)
-TOP VIEW-



TYPE	VCC	VEE
062/072/082/4556A/ M5218/BA15218/ 33178/34182 TYPES	+2 to +16V	−2 to −16V
4580 TYPE	+2 to +18V	−2 to −18V
5532 TYPE	+3 to +20V	−3 to −20V
CXA1297 TYPE	+5 to +12V	−5 to −12V
M5219/M5220 TYPES	+5 to +22.5V	−5 to −22.5V
NJM2100 TYPE	+1 to +3.5V	−1 to −3.5V
OP-297 TYPE	+2 to +20V	−2 to −20V
OTHERS	+5 to +16V	−5 to −16V

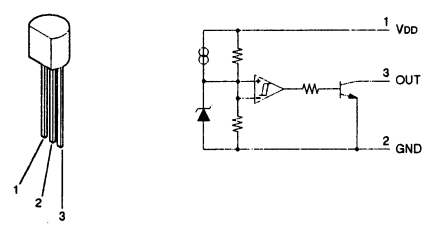
NJM7805FA (JRC)+5V(1 A)
NJM78M09FA (JRC)+9V(0.5 A)

POSITIVE VOLTAGE REGULATOR
—FRONT VIEW—



PST994D (MITSUMI)
PST994D-T

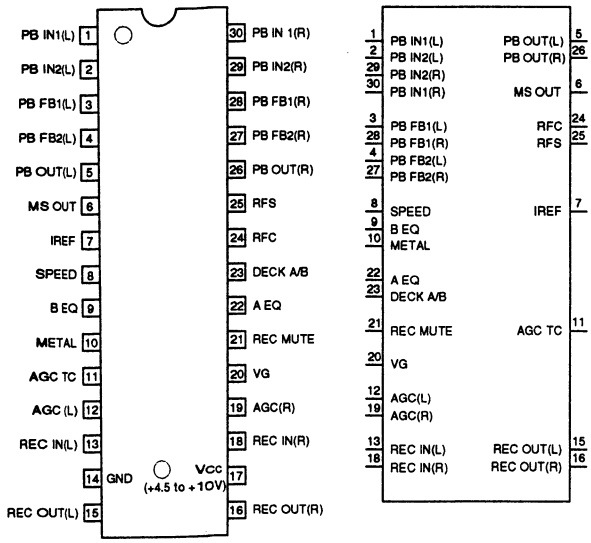
SYSTEM RESET



CXA1498S (SONY)

REC/PB EQUALIZER

-TOP VIEW-



INPUT

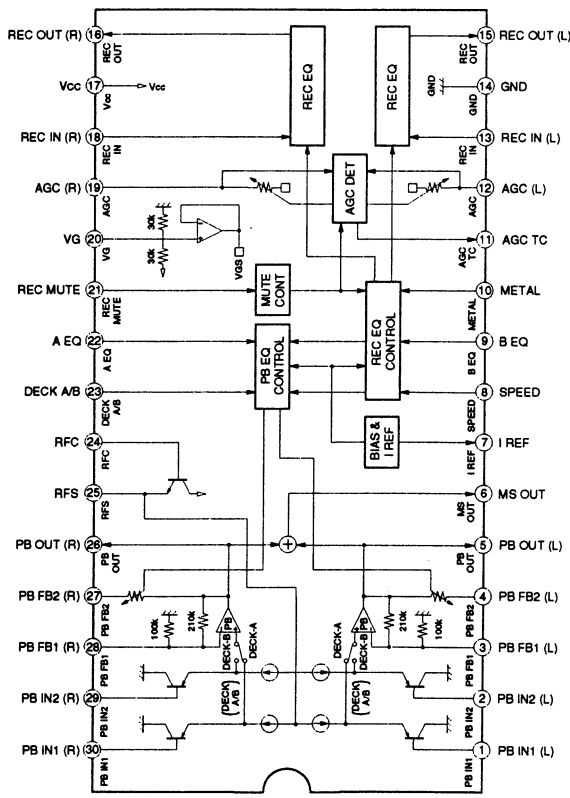
A EQ, B EQ	; PB EQUALIZER H/L SELECT
DECK A/B	; A/B DECK SELECT
METAL	; B DECK METAL/NORMAL SELECT
PB FB 1, 2, (L), (R)	; PB EQUALIZER FEED BACK
PB IN 1, 2, (L), (R)	; PB HEAD A, B, (L), (R)
REC IN (L), (R)	; REC EQUALIZER
REC MUTE	; REC MUTE CONTROL
SPEED	; TAPE SPEED H/L SELECT

OUTPUT

MS OUT	; PB EQUALIZER (L), (R) MIX
PB OUT (L), (R)	; PB EQUALIZER
REC OUT (L), (R)	; REC AMP
RFS	; REFERENCE VOLTAGE

OTHERS

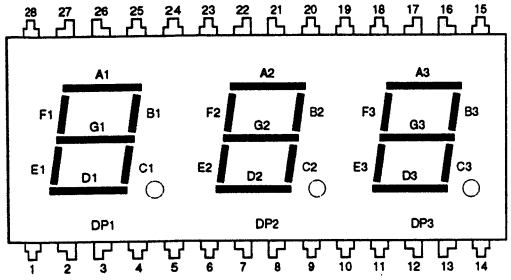
AGC (L), (R)	; AGC TERMINAL
AGC TC	; AGC TIME CONSTANT
IREF	; REFERENCE CURRENT RESISTOR
RFC	; RIPPLE FILTER RC
VG	; 1/2 Vcc RFC



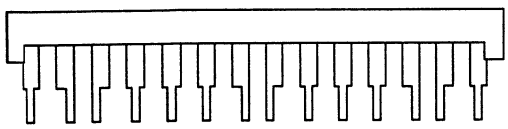
SL-1323-20H (SANYO)

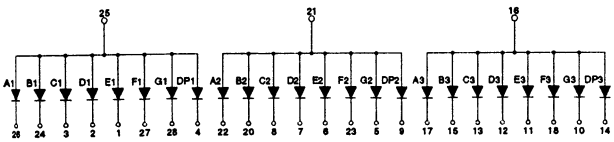
3 x 7-SEGMENT DISPLAY

-TOP VIEW-



-SIDE VIEW-

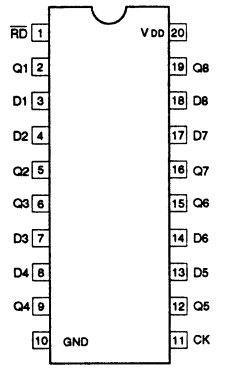


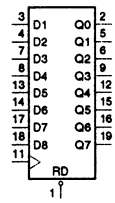


SN74HC273ANS-E05 (TI)FLAT PACKAGE

C-MOS OCTAL D-TYPE FLIP-FLOPS WITH RESET

- TOP VIEW -





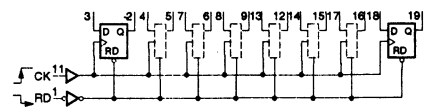
EACH FLIP-FLOP

INPUT			OUTPUT
RD	CK	D	Q
0	X	X	0
1	↑	0	0
1	↑	1	1
1	0	X	Qo

0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE
Qo; NO CHANGE

NOTE :

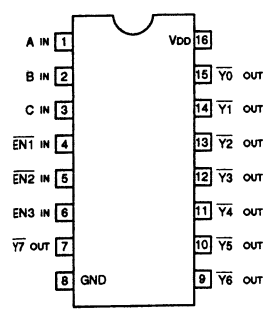
TYPE	VDD
ACT / HCT	+5V
TC74AC / TC74VHC	+2 to +5.5V
OTHER TYPES	+2 to +6V

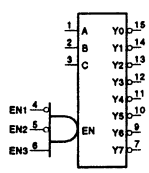


SN74HC138ANS (TI)FLAT PACKAGE
SN74HC138ANS-E05

C-MOS 3-TO-8 LINE DECODER / DEMULTIPLEXER

—TOP VIEW—





NOTE:

TYPE	VDD
74HCT138 TYPE	+5V
74ACT138 TYPE	+4.5 to +5.5V
TC74AC138 TYPE TC74VHC138	+2 to +5.5V
OTHER TYPES	+2 to +6V

INPUTS				OUTPUTS							
EN	C	B	A	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0
0	X	X	X	1	1	1	1	1	1	1	1
1	0	0	0	1	1	1	1	1	1	1	0
1	0	0	1	1	1	1	1	1	1	0	1
1	0	1	0	1	1	1	1	1	0	1	1
1	0	1	1	1	1	1	1	0	1	1	1
1	1	0	0	1	1	1	1	1	1	1	1
1	1	0	1	1	1	1	0	1	1	1	1
1	1	1	0	1	1	0	1	1	1	1	1
1	1	1	1	0	1	1	1	1	1	1	1

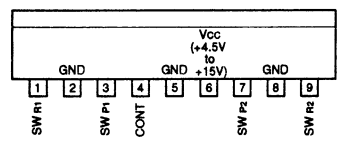
$EN = \overline{EN1} \cdot \overline{EN2} \cdot EN3$

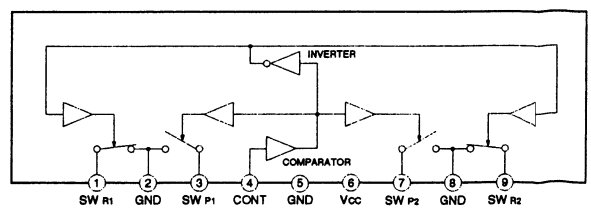
0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE

UPC1330HA-NA (NEC)

AUDIO HEAD SELECTOR

-SIDE VIEW-

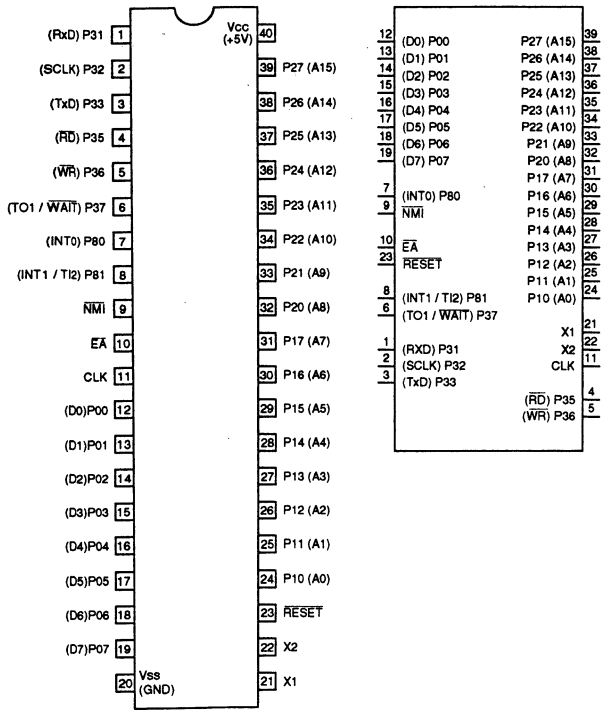




TMP90PH02P (TOSHIBA)

C-MOS 8 BIT MICRO CONTROLLER

-TOP VIEW-



INPUT / OUTPUT

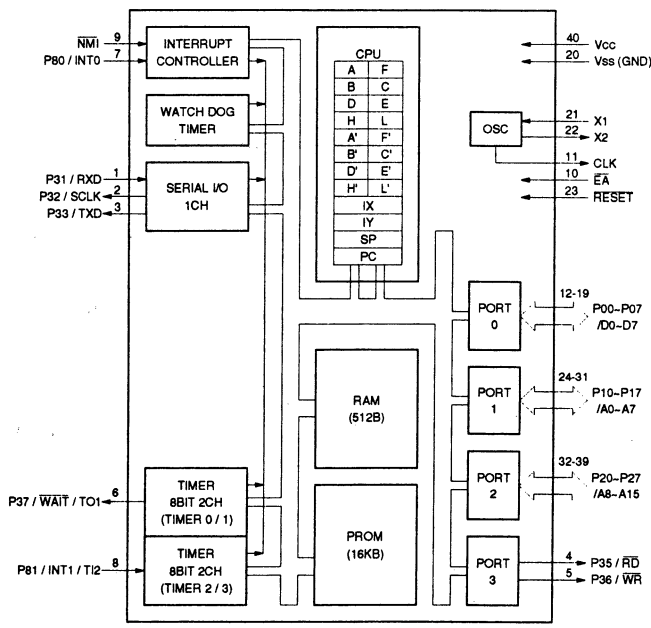
P00-P07 / (D0-D7) ; PROGRAM MEMORY DATA PORT 0
P10-P17 / (A0-A7) ; PROGRAM MEMORY ADDRESS PORT 1
P20-P27 / (A8-A15) ; PROGRAM MEMORY ADDRESS PORT 2

INPUT

EA ; EXTERNAL ACCESS
NMI ; NON-MASCABLE INTERRUPT
P31 / RxD ; PORT31 / SERIAL RECEIVE DATA
P80 / INT0 ; PORT80 / INTERRUPT 0
P81 / INT1 / TI2 ; PORT81 / INTERRUPT 1 / TIMER 2
RESET ; RESET
X1 ; CRYSTAL OSC 1

OUTPUT

CLK ; CLOCK
P32 / SCLK ; PORT32 / SERIAL CLOCK
P33 / TxD ; PORT33 / SERIAL TRANSMIT DATA
P35 / RD ; PORT35 / READ STROBE
P36 / WR ; PORT36 / WRITE STROBE
P37 / WAIT / TO1 ; PORT37 / WAIT / TIMER 1
X2 ; CRYSTAL OSC 2



SECTION 6
SPARE PARTS

6-1. NOTES ON SPARE PARTS

(1) Safety Related Components Warning

Components marked ⚠ on the exploded views and electrical parts list are critical to safety. Replace only with the components specified.

(2) Standardization of Parts

Spare parts supplied from the Sony Parts Center may not always be indentical with the parts actually in use due to accommodating the improved parts and/or engineering changes or standardization of genuine parts. This manual's exploded views and electrical parts lists indicate the part numbers of the standardized genuine parts at present.

(3) Stock of Parts

Parts marked with an "o" in the SP (Supply code) column of the spare parts list are not normally required for routine service work. Orders for parts marked with "o" will be processed, but allow for additional time for delivery.

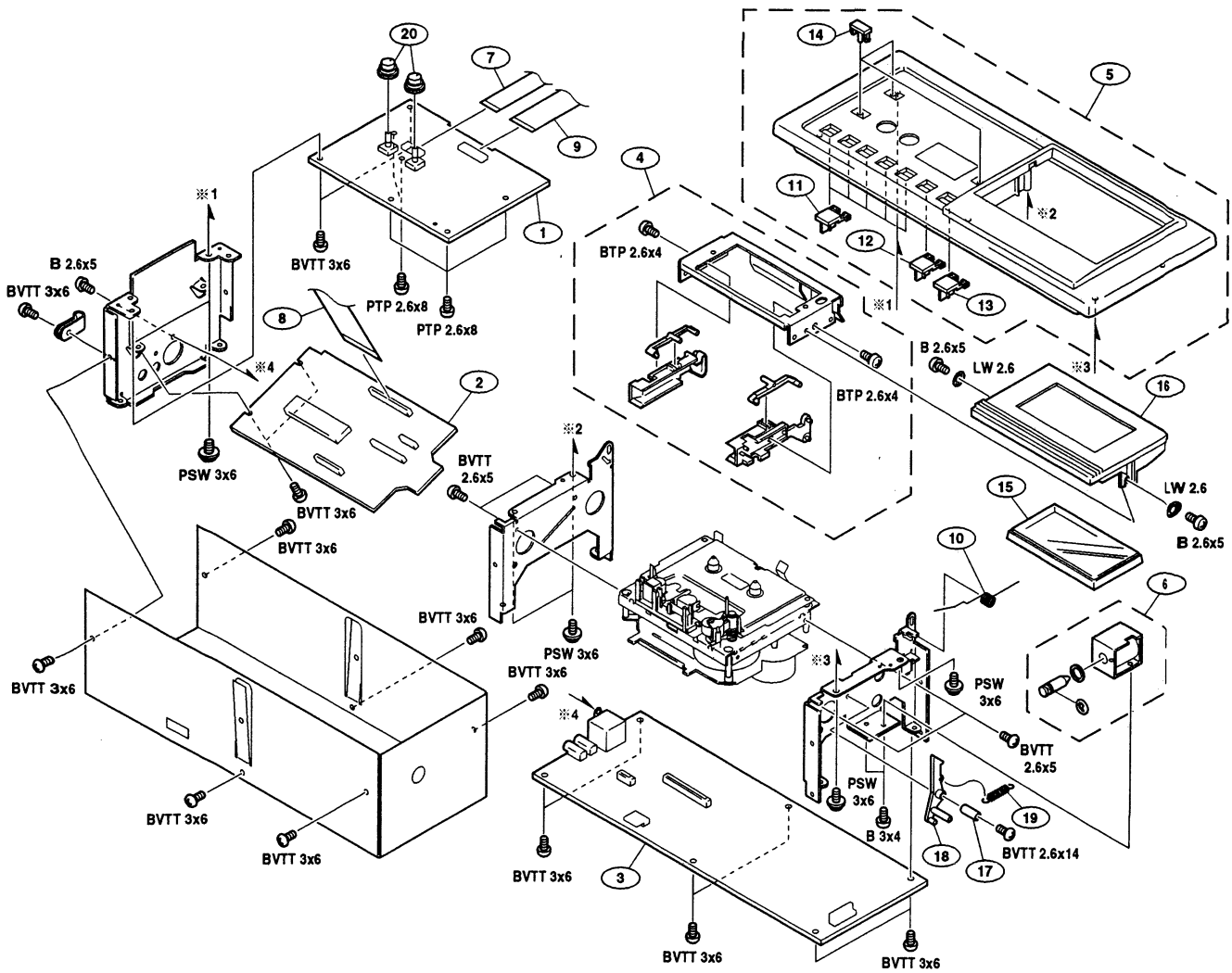
(4) Units for Capacitors, Inductors and Resistors

The following units may be assumed in exploded views and electrical parts lists unless otherwise specified.

Capacitors : μF
Inductors : μH
Resistors : Ω

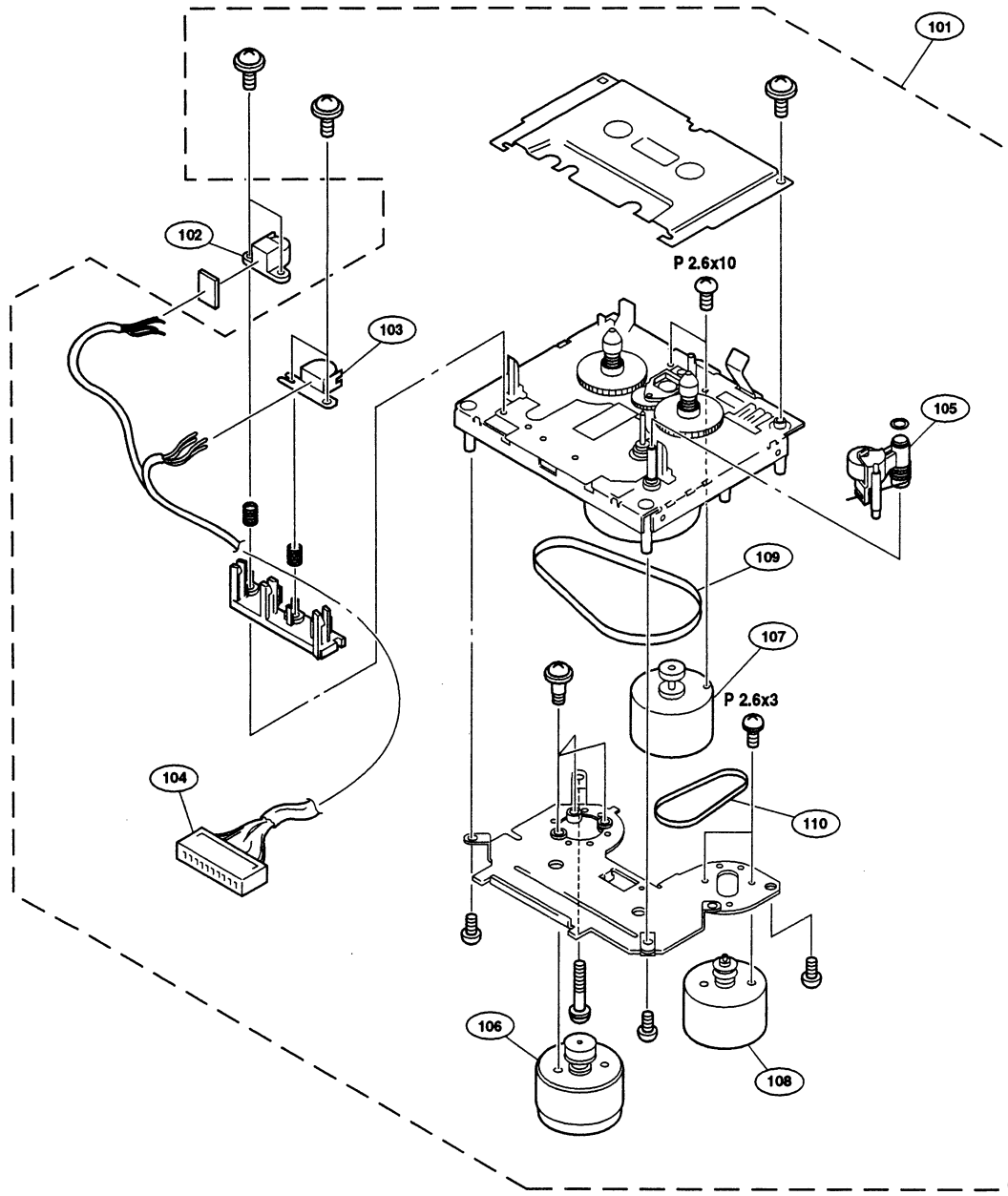
6-2. EXPLODED VIEW AND LIST

Ornamental Panel Block



No.	Part No.	SP	Description
1	A-8312-152-A	o	MOUNTED CIRCUIT BOARD, SW-877
2	A-8312-154-A	o	MOUNTED CIRCUIT BOARD, CPU-239
3	A-8312-156-A	o	MOUNTED CIRCIUIT BOARD, AU-242
4	A-8312-160-A	o	HOLDER ASSY, CASSETTE
5	A-8312-165-A	o	PANEL ASSY (For E)
	A-8315-336-A	o	PANEL ASSY (For CE)
6	1-454-790-11	s	SOLENOID
7	1-782-054-11	o	CABLE, FLAT 7P
8	1-782-055-11	o	CABLE, FLAT 27P
9	1-782-056-11	o	CABLE, FLAT 16P
10	3-161-102-01	s	HOLDER (SP), CASSETTE
11	3-165-012-01	o	KEY (M), TOP
12	3-165-012-21	o	KEY (M), TOP
13	3-165-012-31	o	KEY (M), TOP
14	3-165-013-11	o	KEY (S), TOP
15	3-165-035-01	o	WINDOW, CASSETTE
16	3-165-037-01	o	LID, CASSETTE
17	3-191-690-01	o	SPACER
18	3-191-691-01	o	CLAW, LOCK
19	3-535-355-00	s	SPRING, TENSION
20	3-749-922-21	s	KNOB

Mechanism Deck Block



No.	Part No.	SP	Description
101	A-8313-778-A	s	CASSETTE MECHANISM (CMAH1Z025)
102	1-500-342-21	s	HEAD, (ERASE)
103	1-500-443-11	s	HEAD, (RECORD/PLAYBACK)
104	1-956-925-11	o	HARNESS 10P
105	3-192-443-01	s	ROLLER, PINCH
106	3-192-444-01	s	BLOCK, CAPSTAN MOTOR
107	3-192-445-01	s	BLOCK, REEL MOTOR
108	3-192-446-01	s	BLOCK, ASSIST MOTOR
109	3-192-447-01	s	BELT, CAPSTAN
110	3-192-448-01	s	BELT, ASSIST

6-3. ELECTRICAL PARTS LIST

PARTS CHANGE INFORMATION

In this list, **) marked pats are design-changed.
Applicable Serial No. are as follows.

1) Suffix number: 11
2) Suffix number: 12

3) Serial Number: 40001 to 41000
4) Serial Number: others except 40001 to 41000

AH-60 BOARD

Ref. No.
or Q'ty Part No. SP Description

HE1 1-500-342-21 s HEAD, "ERASE"

AU-242 BOARD

Ref. No. or Q'ty	Part No.	SP	Description
1pc	A-8312-156-A	o	MOUNTED CIRCUIT BOARD, AU-242
C1	1-126-963-11	s	ELECT 4.7uF 20% 50V
C2	1-163-127-00	s	CERAMIC, CHIP 270PF 5% 50V
C3	1-163-009-11	s	CERAMIC, CHIP 0.001uF 10% 50V
C4	1-164-182-11	s	CERAMIC, CHIP 3300PF 10% 100V
C5	1-163-127-00	s	CERAMIC, CHIP 270PF 5% 50V
C6	1-163-009-11	s	CERAMIC, CHIP 0.001uF 10% 50V
C7	1-109-814-11	s	MICA, CHIP 220PF 5% 100V
C8	1-109-814-11	s	MICA, CHIP 220PF 5% 100V
C9-12	1-126-967-11	s	ELECT 47uF 20% 50V
C13	1-126-963-11	s	ELECT 4.7uF 20% 50V
C14	1-136-553-11	s	FILM 0.0015uF 10% 630V
C15	1-130-482-00	s	MYLAR 0.0082uF 5% 50V
C16	1-164-161-11	s	CERAMIC, CHIP 0.0022uF 10% 100V
C17	1-164-161-11	s	CERAMIC, CHIP 0.0022uF 10% 100V
C18	1-163-017-00	s	CERAMIC, CHIP 0.0047uF 5% 50V
C19	1-126-967-11	s	ELECT 47uF 20% 50V
C20	1-126-963-11	s	ELECT 4.7uF 20% 50V
C21	1-126-967-11	s	ELECT 47uF 20% 50V
C22	1-163-251-11	s	CERAMIC, CHIP 100PF 5% 50V
C23	1-126-963-11	s	ELECT 4.7uF 20% 50V
C25	1-163-239-11	s	CERAMIC, CHIP 33PF 5% 50V
C26-28	1-164-346-11	s	CERAMIC 1uF 16V
C29	1-163-227-11	s	CERAMIC, CHIP 10PF 5% 50V
1) C30	1-128-551-11	s	ELECT 22uF 20% 50V
2) C30	1-126-963-11	s	ELECT 4.7uF 20% 50V
C31	1-126-963-11	s	ELECT 4.7uF 20% 50V
C32	1-126-963-11	s	ELECT 4.7uF 20% 50V
C33	1-163-023-00	s	CERAMIC, CHIP 0.015uF 5% 50V
C34	1-164-346-11	s	CERAMIC 1uF 16V
C35	1-164-346-11	s	CERAMIC 1uF 16V
C36	1-163-239-11	s	CERAMIC, CHIP 33PF 5% 50V
C37	1-164-346-11	s	CERAMIC 1uF 16V
C38	1-164-346-11	s	CERAMIC 1uF 16V
C39	1-163-239-11	s	CERAMIC, CHIP 33PF 5% 50V
1) C40	1-164-346-11	s	CERAMIC 1uF 16V
2) C40	1-126-963-11	s	ELECT 4.7uF 20% 50V
C41	1-164-346-11	s	CERAMIC 1uF 16V
C42	1-163-251-11	s	CERAMIC, CHIP 100PF 5% 50V
C43	1-126-963-11	s	ELECT 4.7uF 20% 50V
C45	1-126-963-11	s	ELECT 4.7uF 20% 50V
C46	1-163-023-00	s	CERAMIC, CHIP 0.015uF 5% 50V
C47	1-164-346-11	s	CERAMIC 1uF 16V
C48	1-126-963-11	s	ELECT 4.7uF 20% 50V
C49	1-163-239-11	s	CERAMIC, CHIP 33PF 5% 50V
C50	1-164-346-11	s	CERAMIC 1uF 16V
C51	1-126-963-11	s	ELECT 4.7uF 20% 50V
C52	1-163-239-11	s	CERAMIC, CHIP 33PF 5% 50V
C53	1-164-346-11	s	CERAMIC 1uF 16V
1) C54	1-164-346-11	s	CERAMIC 1uF 16V
2) C54	1-126-963-11	s	ELECT 4.7uF 20% 50V
C55	1-163-239-11	s	CERAMIC, CHIP 33PF 5% 50V
C56	1-126-967-11	s	ELECT 47uF 20% 50V
C57	1-126-963-11	s	ELECT 4.7uF 20% 50V
C58	1-163-239-11	s	CERAMIC, CHIP 33PF 5% 50V
C59	1-164-346-11	s	CERAMIC 1uF 16V
C60	1-164-346-11	s	CERAMIC 1uF 16V
C61	1-164-161-11	s	CERAMIC, CHIP 0.0022uF 10% 100V

(AU-242 BOARD)

Ref. No. or Q'ty	Part No.	SP	Description
C62	1-163-038-91	s	CERAMIC, CHIP 0.1uF 25V
C63	1-126-967-11	s	ELECT 47uF 20% 50V
C64	1-126-967-11	s	ELECT 47uF 20% 50V
C65	1-163-038-91	s	CERAMIC, CHIP 0.1uF 25V
C66	1-126-963-11	s	ELECT 4.7uF 20% 50V
C67	1-126-963-11	s	ELECT 4.7uF 20% 50V
C69	1-126-935-11	s	ELECT 470uF 20% 16V
C70	1-164-346-11	s	CERAMIC 1uF 16V
C71	1-163-038-91	s	CERAMIC, CHIP 0.1uF 25V
C73	1-126-967-11	s	ELECT 47uF 20% 50V
C74	1-164-346-11	s	CERAMIC 1uF 16V
C75	1-163-038-91	s	CERAMIC, CHIP 0.1uF 25V
C77	1-126-967-11	s	ELECT 47uF 20% 50V
C78-82	1-163-038-91	s	CERAMIC, CHIP 0.1uF 25V
C84	1-126-967-11	s	ELECT 47uF 20% 50V
3) C86	1-126-967-11	s	ELECT 47uF 20% 50V
4) C86	1-126-935-11	s	ELECT 470uF 20% 16V
C87	1-126-967-11	s	ELECT 47uF 20% 50V
C88	1-163-038-91	s	CERAMIC, CHIP 0.1uF 25V
C89	1-164-346-11	s	CERAMIC 1uF 16V
C90	1-126-963-11	s	ELECT 4.7uF 20% 50V
1) C91	1-164-346-11	s	CERAMIC 1uF 16V
2) C91	1-126-963-11	s	ELECT 4.7uF 20% 50V
C92	1-163-239-11	s	CERAMIC, CHIP 33PF 5% 50V
C93	1-126-967-11	s	ELECT 47uF 20% 50V
C94-96	1-164-346-11	s	CERAMIC 1uF 16V
C97	1-163-005-11	s	CERAMIC, CHIP 470PF 10% 50V
C98	1-163-005-11	s	CERAMIC, CHIP 470PF 10% 50V
C100	1-163-019-00	s	CERAMIC, CHIP 0.0068uF 10% 50V
C101	1-164-232-11	s	CERAMIC, CHIP 0.01uF 10% 16V
C103	1-126-963-11	s	ELECT 4.7uF 20% 50V
C104	1-163-038-91	s	CERAMIC, CHIP 0.1uF 25V
C108	1-126-935-11	s	ELECT 470uF 20% 16V
C110	1-126-935-11	s	ELECT 470uF 20% 16V
C111	1-126-967-11	s	ELECT 47uF 20% 50V
C113	1-164-182-11	s	CERAMIC, CHIP 3300PF 10% 16V
2) C201	1-163-251-11	s	CERAMIC, CHIP 100PF 5% 50V
2) C202	1-163-251-11	s	CERAMIC, CHIP 100PF 5% 50V
CN1	1-569-536-11	s	CONNECTOR 7P, FEMALE
CN2	1-508-796-00	o	CONNECTOR 2P, MALE
CN3	1-779-003-11	o	DIN 8P, FEMALE
CN4	1-569-535-11	s	CONNECTOR 27P, FEMALE
CN5	1-508-744-00	o	CONNECTOR 10P, MALE
CN6	1-560-368-00	o	CONNECTOR, ILG 6P, MALE
CP1	1-409-476-11	s	TRAP
CP2	1-409-476-11	s	TRAP
CP3	1-409-477-11	s	TRAP
D1	8-719-801-78	s	DIODE 1SS184
D2	8-719-801-78	s	DIODE 1SS184
D3	8-719-037-24	s	DIODE RD12SB3-T1
D5	8-719-200-76	s	DIODE 10E1N
D11	8-719-157-97	s	DIODE RD3.6SB
D12	8-719-157-97	s	DIODE RD3.6SB
D13	8-719-801-78	s	DIODE 1SS184
D15	8-719-801-78	s	DIODE 1SS184
D16	8-719-988-62	s	DIODE 1SS355
D17	8-719-988-62	s	DIODE 1SS355

(AU-242 BOARD)

Ref. No. or Q'ty	Part No.	SP	Description
IC1	8-759-079-42	s	IC UPC1330HA-NA
IC2	1-809-920-11	s	IC BA7755A
IC3	8-752-053-85	s	IC CXA1498S
IC4	8-759-745-64	s	IC NJM4560M
IC5	8-759-745-64	s	IC NJM4560M
IC6	8-759-385-17	s	IC NJM4580E(TE2)
IC7	8-759-745-64	s	IC NJM4560M
IC8	8-759-385-17	s	IC NJM4580E(TE2)
IC9	8-759-701-59	s	IC NJM78M09FA
IC10	8-759-701-75	s	IC NJM7805FA
IC11	8-759-701-51	s	IC NJM2072M
J1	1-573-798-21	s	JACK, MINI
J2	1-573-798-11	s	JACK, MINI
L1	1-408-421-00	s	INDUCTOR 100uH
L5	1-408-607-31	s	INDUCTOR 22uH
L7	1-411-213-11	s	TRANSFORMER, BALUN
LV1	1-412-462-11	s	COIL, VAR 490uH
Q1-3	8-729-901-00	s	TRANSISTOR DTC124EK
Q4	8-729-807-35	s	TRANSISTOR 2SB1123-T
Q5	8-729-901-00	s	TRANSISTOR DTC124EK
Q6	8-729-207-46	s	TRANSISTOR 2SC3112B-TPE2
Q7	8-729-901-00	s	TRANSISTOR DTC124EK
Q8	8-729-207-46	s	TRANSISTOR 2SC3112B-TPE2
Q9	8-729-207-46	s	TRANSISTOR 2SC3112B-TPE2
Q10	8-729-901-00	s	TRANSISTOR DTC124EK
Q11	8-729-901-00	s	TRANSISTOR DTC124EK
Q12-20	8-729-202-38	s	TRANSISTOR 2SC3326N
Q21	8-729-901-00	s	TRANSISTOR DTC124EK
Q22	8-729-901-00	s	TRANSISTOR DTC124EK
Q23	8-729-202-38	s	TRANSISTOR 2SC3326N
Q24	8-729-901-00	s	TRANSISTOR DTC124EK
Q25	8-729-807-35	s	TRANSISTOR 2SB1123-T
Q26	8-729-103-33	s	TRANSISTOR 2SD1310-K
Q27	8-729-140-93	s	TRANSISTOR 2SB733-34
Q28	8-729-901-00	s	TRANSISTOR DTC124EK
Q30-34	8-729-901-00	s	TRANSISTOR DTC124EK
R1	1-216-037-00	s	METAL, CHIP 330 5% 1/10W
R2	1-216-095-00	s	METAL, CHIP 82K 5% 1/10W
R3	1-216-689-11	s	METAL, CHIP 39K 0.5% 1/10W
R4	1-216-085-00	s	METAL, CHIP 33K 5% 1/10W
R5	1-216-095-00	s	METAL, CHIP 82K 5% 1/10W
R6	1-216-689-11	s	METAL, CHIP 39K 0.5% 1/10W
R7-9	1-216-073-00	s	METAL, CHIP 10K 5% 1/10W
R10	1-216-083-00	s	METAL, CHIP 27K 5% 1/10W
R11	1-216-121-91	s	METAL, CHIP 1M 5% 1/10W
R12	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R13	1-216-073-00	s	METAL, CHIP 10K 5% 1/10W
R14	1-216-081-00	s	METAL, CHIP 22K 5% 1/10W
R15	1-216-081-00	s	METAL, CHIP 22K 5% 1/10W
R16	1-216-053-00	s	METAL, CHIP 1.5K 5% 1/10W
R17	1-216-057-00	s	METAL, CHIP 2.2K 5% 1/10W
R18	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R19	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R20	1-216-071-00	s	METAL, CHIP 8.2K 5% 1/10W
R21	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R23	1-216-073-00	s	METAL, CHIP 10K 5% 1/10W

(AU-242 BOARD)

Ref. No. or Q'ty	Part No.	SP	Description
R24	1-216-059-00	s	METAL, CHIP 2.7K 5% 1/10W
R25	1-216-057-00	s	METAL, CHIP 2.2K 5% 1/10W
R26	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R27	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R28	1-216-101-00	s	METAL, CHIP 150K 5% 1/10W
R29	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R30	1-216-089-91	s	METAL, CHIP 47k 5% 1/10W
R31	1-216-071-00	s	METAL, CHIP 8.2K 5% 1/10W
R32	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R33	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R35	1-216-073-00	s	METAL, CHIP 10K 5% 1/10W
R36	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R38	1-216-091-00	s	METAL, CHIP 56K 5% 1/10W
R39	1-216-071-00	s	METAL, CHIP 8.2K 5% 1/10W
R40	1-216-029-00	s	METAL, CHIP 150 5% 1/10W
R41	1-216-059-00	s	METAL, CHIP 2.7K 5% 1/10W
R42	1-216-105-91	s	METAL, CHIP 220k 5% 1/10W
R43	1-216-091-00	s	METAL, CHIP 56K 5% 1/10W
R44	1-216-065-00	s	METAL, CHIP 4.7K 5% 1/10W
R45	1-216-091-00	s	METAL, CHIP 56K 5% 1/10W
R46	1-216-021-00	s	METAL, CHIP 68 5% 1/10W
R47	1-216-073-00	s	METAL, CHIP 10K 5% 1/10W
R48	1-216-013-00	s	METAL, CHIP 33 5% 1/10W
R49	1-216-057-00	s	METAL, CHIP 2.2K 5% 1/10W
R50	1-216-105-91	s	METAL, CHIP 220k 5% 1/10W
R51	1-216-091-00	s	METAL, CHIP 56K 5% 1/10W
R52	1-216-065-00	s	METAL, CHIP 4.7K 5% 1/10W
R53	1-216-041-00	s	METAL, CHIP 470 5% 1/10W
R54	1-216-041-00	s	METAL, CHIP 470 5% 1/10W
R55	1-216-071-00	s	METAL, CHIP 8.2K 5% 1/10W
R56	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R57	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R58	1-216-071-00	s	METAL, CHIP 8.2K 5% 1/10W
R59	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R60	1-216-085-00	s	METAL, CHIP 33K 5% 1/10W
R61	1-216-105-91	s	METAL, CHIP 220k 5% 1/10W
R62	1-216-021-00	s	METAL, CHIP 68 5% 1/10W
R63	1-216-021-00	s	METAL, CHIP 68 5% 1/10W
R64	1-216-091-00	s	METAL, CHIP 56K 5% 1/10W
R65	1-216-065-00	s	METAL, CHIP 4.7K 5% 1/10W
R66	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R67	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R68	1-216-085-00	s	METAL, CHIP 33K 5% 1/10W
R69	1-216-071-00	s	METAL, CHIP 8.2K 5% 1/10W
R70	1-216-085-00	s	METAL, CHIP 33K 5% 1/10W
R71	1-216-061-00	s	METAL, CHIP 3.3K 5% 1/10W
R72	1-216-085-00	s	METAL, CHIP 33K 5% 1/10W
R73	1-216-061-00	s	METAL, CHIP 3.3K 5% 1/10W
R74	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R75	1-216-071-00	s	METAL, CHIP 8.2K 5% 1/10W
R76	1-216-077-00	s	METAL, CHIP 15K 5% 1/10W
R77	1-216-025-91	s	METAL, CHIP 100 5% 1/10W
R78	1-216-073-00	s	METAL, CHIP 10K 5% 1/10W
R79	1-216-073-00	s	METAL, CHIP 10K 5% 1/10W
R80	1-260-096-11	s	CARBON 560 5% 1/2W
R81	1-216-073-00	s	METAL, CHIP 10K 5% 1/10W
R82	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R84	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R85	1-260-094-11	s	CARBON 390 5% 1/2W

(AU-242 BOARD)

Ref. No. or Q'ty	Part No.	SP	Description
R86	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R87	1-216-053-00	s	METAL, CHIP 1.5K 5% 1/10W
R88	1-216-689-11	s	METAL, CHIP 39K 0.5% 1/10W
R89	1-216-689-11	s	METAL, CHIP 39K 0.5% 1/10W
R90	1-216-083-00	s	METAL, CHIP 27K 5% 1/10W
R91	1-216-025-91	s	METAL, CHIP 100 5% 1/10W
R92	1-216-025-91	s	METAL, CHIP 100 5% 1/10W
R93	1-216-306-11	s	METAL, CHIP 3.9 5% 1/10W
R94	1-216-053-00	s	METAL, CHIP 1.5K 5% 1/10W
R95	1-216-053-00	s	METAL, CHIP 1.5K 5% 1/10W
R96	1-216-071-00	s	METAL, CHIP 8.2K 5% 1/10W
R97	1-216-093-00	s	METAL, CHIP 68K 5% 1/10W
R98	1-216-085-00	s	METAL, CHIP 33K 5% 1/10W
R99	1-216-085-00	s	METAL, CHIP 33K 5% 1/10W
R100	1-216-105-91	s	METAL, CHIP 220k 5% 1/10W
R101	1-216-105-91	s	METAL, CHIP 220k 5% 1/10W
R102	1-216-105-91	s	METAL, CHIP 220k 5% 1/10W
R103	1-216-091-00	s	METAL, CHIP 56K 5% 1/10W
R104	1-216-091-00	s	METAL, CHIP 56K 5% 1/10W
R105	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R106	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R107	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
R108	1-216-041-00	s	METAL, CHIP 470 5% 1/10W
R109	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R110	1-216-057-00	s	METAL, CHIP 2.2K 5% 1/10W
R111	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
3) R112	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
4) R112	1-216-065-00	s	METAL, CHIP 4.7K 5% 1/10W
3) R113	1-216-097-91	s	METAL, CHIP 100k 5% 1/10W
4) R113	1-216-065-00	s	METAL, CHIP 4.7K 5% 1/10W
R114	1-215-936-11	s	METAL 100 5% 5W
R115	1-216-308-00	s	METAL, CHIP 4.7 5% 1/10W
R117	1-216-306-11	s	METAL, CHIP 3.9 5% 1/10W
R118	1-212-851-00	s	RES, FUSIBLE 5.6 5% 1/4W
R119	1-216-306-11	s	METAL, CHIP 3.9 5% 1/10W
R120	1-216-025-91	s	METAL, CHIP 100 5% 1/10W
R121	1-216-025-91	s	METAL, CHIP 100 5% 1/10W
R122	1-216-025-91	s	METAL, CHIP 100 5% 1/10W
R123	1-215-936-11	s	METAL 100 5% 5W
R124	1-216-091-00	s	METAL, CHIP 56K 5% 1/10W
R125	1-216-041-00	s	METAL, CHIP 470 5% 1/10W
R126	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R127	1-216-073-00	s	METAL, CHIP 10K 5% 1/10W
RB1	1-235-192-00	s	RESISTOR BLOCK 1KX8
RV1	1-241-786-11	s	RES, ADJ METAL 22k
RV2	1-241-786-11	s	RES, ADJ METAL 22k
RV5	1-238-543-11	s	RES, ADJ, CARBON 470
RV6	1-241-787-11	s	RES, ADJ METAL 47k
RV7	1-241-789-11	s	RES, ADJ METAL 220k
RV8	1-241-789-11	s	RES, ADJ METAL 220k
RY1	1-515-709-11	s	RELAY
T1	1-431-106-11	s	TRANSFORMER, BIAS OSCILLATION

CPU-239 BOARD

Ref. No. or Q'ty	Part No.	SP	Description
1pc	A-8312-154-A	o	MOUNTED CIRCUIT BOARD, CPU-239
C1	1-163-038-91	s	CERAMIC, CHIP 0.1uF 25V
C2	1-163-038-91	s	CERAMIC, CHIP 0.1uF 25V
C3	1-126-967-11	s	ELECT 47uF 20% 50V
C4-7	1-163-038-91	s	CERAMIC, CHIP 0.1uF 25V
C8	1-128-551-11	s	ELECT 22uF 20% 50V
C9	1-163-038-91	s	CERAMIC, CHIP 0.1uF 25V
C10	1-163-038-91	s	CERAMIC, CHIP 0.1uF 25V
C11	1-128-551-11	s	ELECT 22uF 20% 50V
C12	1-126-967-11	s	ELECT 47uF 20% 50V
C13	1-163-038-91	s	CERAMIC, CHIP 0.1uF 25V
1) C14	1-163-009-11	s	CERAMIC, CHIP 0.001uF 10% 50V
1) C15	1-163-009-11	s	CERAMIC, CHIP 0.001uF 10% 50V
C16-19	1-126-935-11	s	ELECT 470uF 20% 16V
C20	1-164-346-11	s	CERAMIC 1uF 16V
C21	1-163-038-91	s	CERAMIC, CHIP 0.1uF 25V
C22	1-163-023-00	s	CERAMIC, CHIP 0.015uF 5% 50V
CN1	1-562-716-11	s	CONNECTOR 16P, FEMALE
CN2	1-564-708-11	o	CONNECTOR 6P, MALE
CN3	1-564-713-11	o	CONNECTOR 11P, MALE
CN4	1-569-535-11	s	CONNECTOR 27P, FEMALE
CN11	1-526-662-21	o	SOCKET, IC (DP) 40P
D1-6	8-719-988-62	s	DIODE 1SS355
D7	8-719-033-53	s	DIODE RD6.8SB2-T1
D8	8-719-158-09	s	DIODE RD4.7SB2
D9	8-719-158-37	s	DIODE RD9.1SB2
D10	8-719-801-78	s	DIODE 1SS184
IC1	8-759-474-58	o	IC TMP90PH-ER8020V102, PROM
IC2	8-759-926-11	s	IC SN74HC138ANS
IC3	8-759-256-72	s	IC PST994D
IC4	8-759-926-56	s	IC SN74HC273ANS
IC5	8-759-913-06	s	IC BA6209
IC6	8-759-913-06	s	IC BA6209
IC7	8-759-701-59	s	IC NJM78M09FA
L1	1-408-421-00	s	INDUCTOR 100uH
L2	1-408-421-00	s	INDUCTOR 100uH
Q8	8-729-901-00	s	TRANSISTOR DTC124EK
Q9	8-729-901-00	s	TRANSISTOR DTC124EK
Q10	8-729-027-31	s	TRANSISTOR DTA124EKA-T14
Q11	8-729-901-00	s	TRANSISTOR DTC124EK
Q12	8-729-901-00	s	TRANSISTOR DTC124EK
Q13	8-729-027-31	s	TRANSISTOR DTA124EKA-T14
Q14	8-729-901-00	s	TRANSISTOR DTC124EK
R1	1-216-073-00	s	METAL, CHIP 10K 5% 1/10W
R2	1-216-025-91	s	METAL, CHIP 100 5% 1/10W
R3	1-216-065-00	s	METAL, CHIP 4.7K 5% 1/10
R4-11	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R12	1-216-041-00	s	METAL, CHIP 470 5% 1/10W
R13-15	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
1) R16	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
2) R16	1-216-041-00	s	METAL, CHIP 470 5% 1/10W
R17	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R18	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R19	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R20	1-216-081-00	s	METAL, CHIP 22K 5% 1/10W

(CPU-239 BOARD)

Ref. No. or Q'ty	Part No.	SP	Description
R21	1-216-061-00	s	METAL, CHIP 3.3K 5% 1/10W
R22	1-212-851-00	s	RES, FUSIBLE 5.6 5% 1/4W
R23	1-212-851-00	s	RES, FUSIBLE 5.6 5% 1/4W
R24	1-216-065-00	s	METAL, CHIP 4.7K 5% 1/10W
R25	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R26	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R27	1-216-065-00	s	METAL, CHIP 4.7K 5% 1/10W
R28	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R29	1-216-089-91	s	METAL, CHIP 47k 5% 1/10W
R30	1-216-029-00	s	METAL, CHIP 150 5% 1/10W
R31	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R32	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R33	1-216-061-00	s	METAL, CHIP 3.3K 5% 1/10W
R34-38	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R39	1-216-073-00	s	METAL, CHIP 10K 5% 1/10W
1) R40	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R41	1-216-001-00	s	METAL, CHIP 10 5% 1/10W
R42	1-216-047-91	s	METAL, CHIP 820 5% 1/10W
R43	1-216-079-00	s	METAL, CHIP 18K 5% 1/10W
2) R44	1-216-065-00	s	METAL, CHIP 4.7K 5% 1/10W
2) R45	1-216-065-00	s	METAL, CHIP 4.7K 5% 1/10W
2) R46	1-216-065-00	s	METAL, CHIP 4.7K 5% 1/10W
2) R47	1-216-065-00	s	METAL, CHIP 4.7K 5% 1/10W
R48	1-216-041-00	s	METAL, CHIP 470 5% 1/10W
R49	1-216-065-00	s	METAL, CHIP 4.7K 5% 1/10W
RV1	1-241-763-11	s	RES, ADJ METAL 4.7k
RV2	1-241-630-11	s	RES, ADJ, CARBON 10K
RV3	1-241-763-11	s	RES, ADJ METAL 4.7k
TH1	1-800-198-11	s	THERMISTOR, S-1K
X1	1-579-929-11	s	RESONATOR, CERAMIC 9.83000000MHz

SW-877 BOARD

Ref. No. or Q'ty	Part No.	SP	Description
1pc	A-8312-152-A	o	MOUNTED CIRCUIT BOARD, SW-877
4pcs	3-349-577-01	o	HOLDER (C), LED
CN100	1-580-400-11	o	CONNECTOR, FPC 16P
CN101	1-563-969-11	o	CONNECTOR, F.P.C 7P
D100-104	8-719-988-62	s	DIODE 1SS355
D110	8-719-060-51	s	DIODE SL-1323-20H
D111-114	8-719-981-55	s	LED GL8HD22, RED
Q100-107	8-729-901-00	s	TRANSISTOR DTC124EK
R100-107	1-216-039-00	s	METAL, CHIP 390 5% 1/10W
R108	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R109	1-216-049-91	s	METAL, CHIP 1k 5% 1/10W
R110	1-216-073-00	s	METAL, CHIP 10K 5% 1/10W
R111	1-216-073-00	s	METAL, CHIP 10K 5% 1/10W
R200	1-216-077-00	s	METAL, CHIP 15K 5% 1/10W
R201	1-216-077-00	s	METAL, CHIP 15K 5% 1/10W
RV100	1-225-416-11	s	RES, VAR, CARBON 10K
RV101	1-225-416-11	s	RES, VAR, CARBON 10K
SW100-109	1-572-404-11	s	SWITCH, PUSH

FRAME

Ref. No. or Q'ty	Part No.	SP	Description
1pc	1-454-790-11	s	SOLENOID To CN2/AU-242 board
1pc	1-956-925-12	o	HARNESS 10P CN5/AU-242 board to AH-60 board
1pc	1-782-054-11	o	CABLE, FLAT 7P CN1/AU-242 board to CN101/SW-877 bo
1pc	1-782-055-11	o	CABLE, FLAT 27P CN4/AU-242 board to CN4/CPU-239 boa
1pc	1-782-056-11	o	CABLE, FLAT 16P CN1/CPU-239 board to CN100/SW-877 b

(Unstock Parts)
MD HARNESS 1 (11P)
CN3/CPU-239 board to MD ASSY

MD HARNESS 2 (6P)
CN2/CPU-239 board to MD ASSY

6-4. OPTIONAL FIXTURES

LL CONTROL CONSOLE, LLC-8000

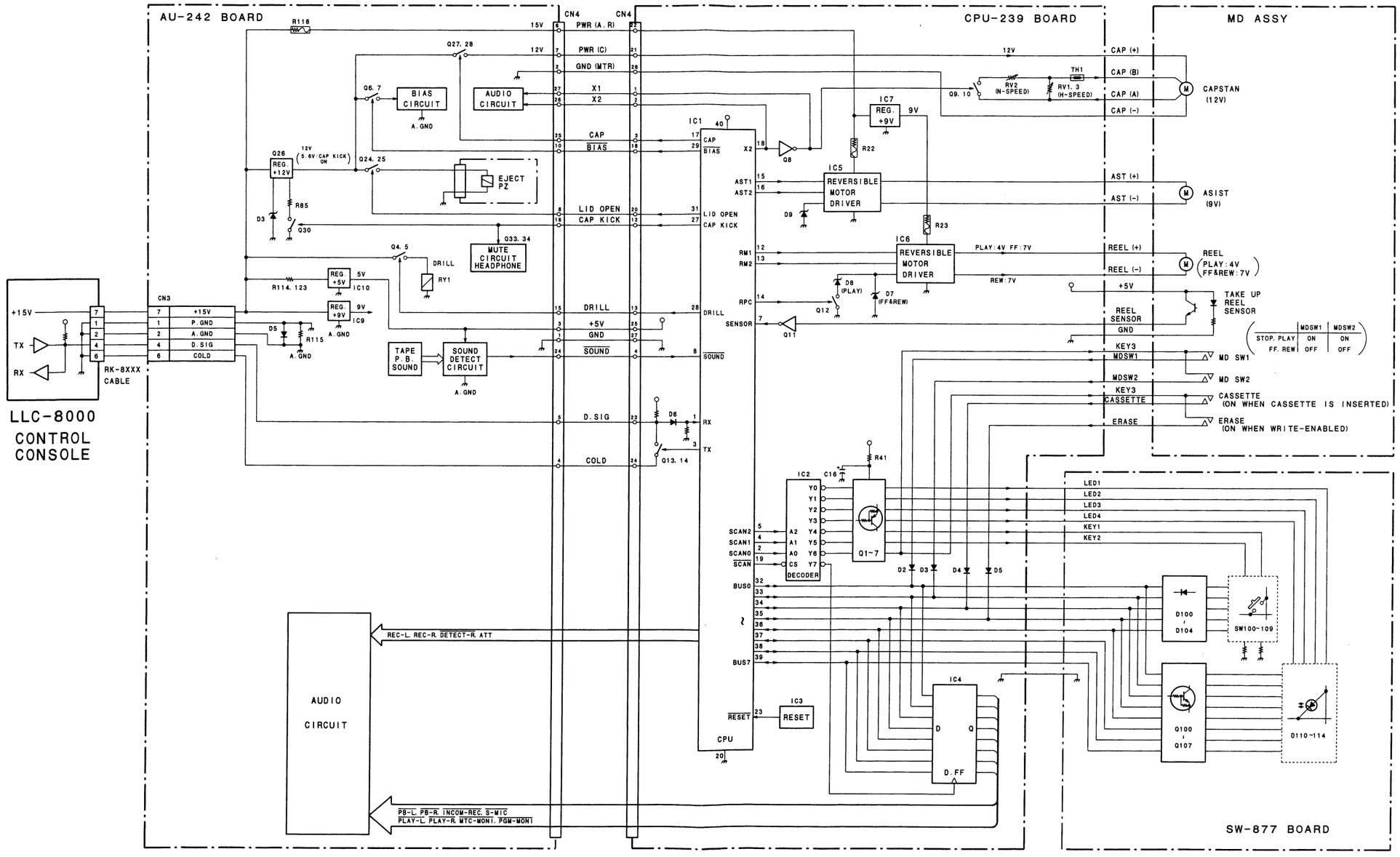
CONNECTING CABLE (2M), RK-8000
CONNECTING CABLE (8M), RK-8080
CONNECTING CABLE (11M), RK-8110

CONNECTING CABLE (14M), RK-8140
CONNECTING CABLE (17M), RK-8170
CONNECTING CABLE (20M), RK-8200

SECTION 7
OUTLINE OF CIRCUIT DESCRIPTION AND BLOCK DIAGRAMS

7-1

7-1. DIGITAL BLOCK



7-2

DIGITAL BLOCK

This section gives an outline of the circuit.

(1) Mechanism deck

Capstan motor

The speed of the capstan motor changes depending on the value of the resistance between the CAP (A) pin and the CAP (B) pin. The double speed is controlled by the resistance values of RV1 and RV3 on the CPU-239 board. The standard speed is controlled by the resistance values of RV1, RV2 and RV3.

Reel motor

The reel motor is driven by the IC6 on the CPU-239 board. The motor rotates in the direction of PLAY or FF when the RM1 pin of the CPU is high, and rotates in the direction of REW when the RM2 pin of the CPU is high. The reel motor voltage generates 7 V for FF and REW at D7 and generates 4 V for PLAY at D8 by turning on Q12.

Assist motor

The rotation of the reel motor is transferred to the reel table or the head base moves up and down depending on the rotation angle of this motor. The rotation angle is detected at the switches MD SW1 and MD SW2 in the MD assy. The assist motor is driven by IC5 on the CPU-239 board. The direction of rotation is decided at the AST1 and AST2 pins of the CPU and the voltage is decided at D9.

(2) Power supply

CONTROL

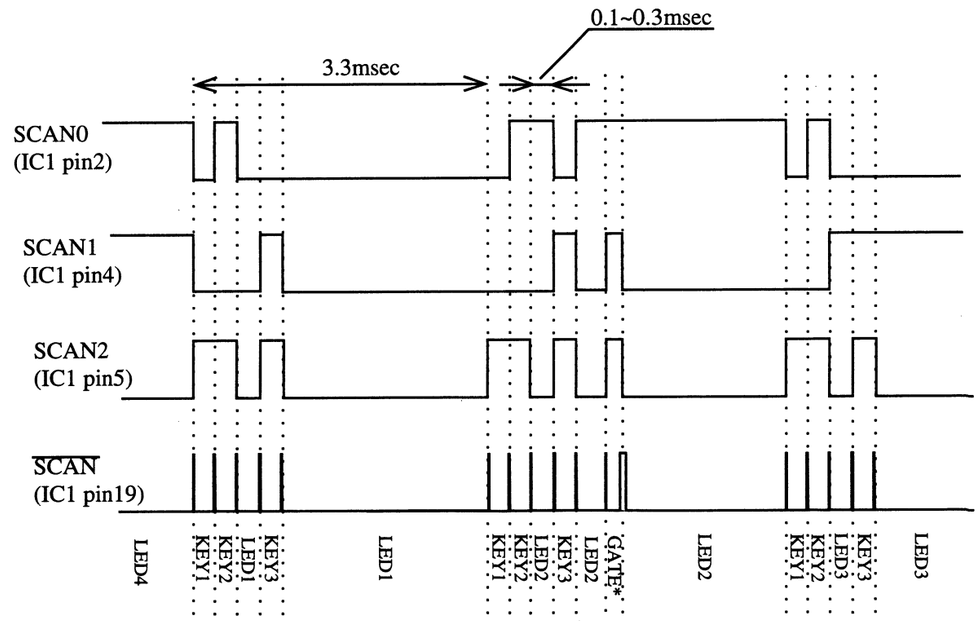
IC9 on the AU-242 board generates 9 V for audio, IC10 generates 5 V for digital, and Q26 generates 12 V for the capstan motor, the bias circuit and the eject plunger solenoid out of DC 15 V supplied from the console.
Excess electric current flows when the capstan motor starts up by turning on Q27 and Q28 on the AU-242 board. So, the Q26 output is once lowered from 12 V to 5.6 V by turning on Q30 on the AU-242 board to reduce the electric current during start up. Simultaneously, the headphone output is muted at Q33 and Q34 on the AU-242 board to reduce the noise during start up of the motor. The headphone output is also muted when the ER-8020 is in the standby state (when the counter display is not lit).
IC7 on the CPU-239 board drops the voltage from 15 V to 9 V and supplies it to IC6 on the CPU-239 board, which suppresses a rise in temperature of IC6.
There are two GNDs, A. GND for audio and COLD for communication other than P. GND for power supply. The electric potential of P. GND alters due to the current consumption of the ER-8020 when a long RK cable is used. Therefore, there is an exclusive GND for the respective usages.

CAUTION:
Short pins 1, 2 and 6 of CN3 on the AU-242 board before supplying 15 V to CN3 pin-7 when repairing the ER-8020 as a single unit. If pins 1, 2 and 6 are not shorted, malfunction could occur.
Connect each of the CN3 pins 1, 2 and 6 respectively when connecting to the LLC-8000.

(3) LED, KEY scan

The CPU (IC1 on the CPU-239 board) processes by scanning the LEDs and the switches via the DECODER of IC2 on the CPU-239 board every 3.3 msec.
When the main power of the CPU is supplied, the CPU begins scanning KEY 1 to KEY 3. Then, the CPU rotates the assist motor in the forward and reverse directions and stops it in the stop position (detected by MD SW1 and MD SW2 of the MD assy).
The CPU then scans KEY 1 and KEY 2 to detect the switch of the control panel.
Therefore, if there is any trouble in KEY 1 to 3 or the BUS 0 to 7 (IC1 pins 32 to 39), the ER-8020 does not operate.

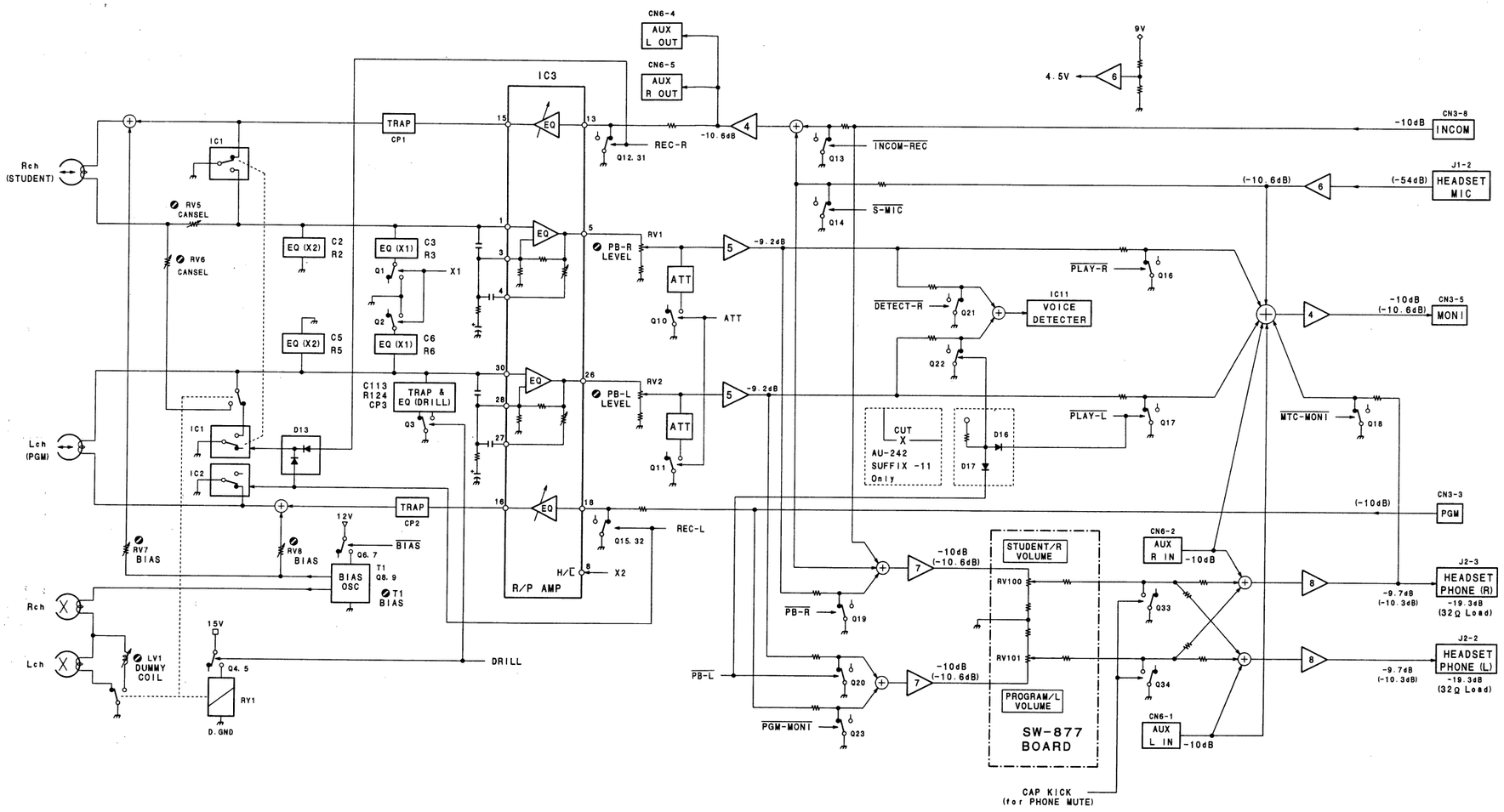
LED,KEY scan (IC1 on the CPU-239 board)



*: When the value of IC4 on CPU-239 board is not changed, there is no above waveform.

 AUDIO BLOCK (AU-242 Board)

7-2. AUDIO BLOCK (AU-242 Board)



 7-4

7-2-1. Audio (AU-242 Board) Block Diagram

(1) AUX pins

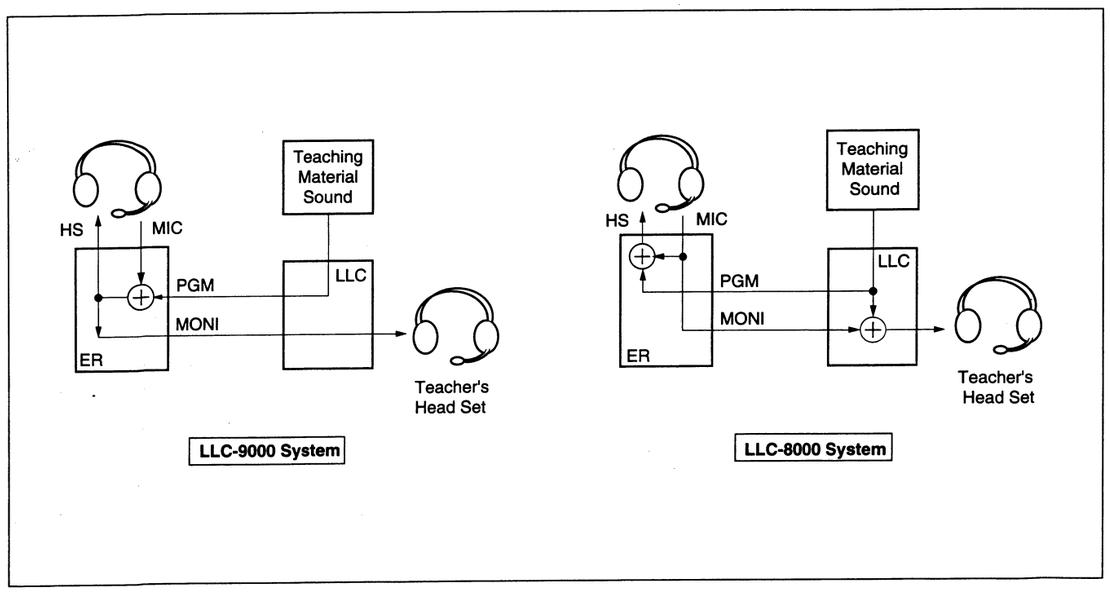
The system allows audio input/output to and from a PC via AUX pins. When the $\overline{\text{INCOM-REC}}$ signal is low, the audio from the INCOM is output from the AUX L OUT and the AUX R OUT. When the $\overline{\text{S-MIC}}$ signal is low, the audio of the HEADSET MIC is output from the AUX L OUT and the AUX R OUT. (The audio of the PGM is not output.)
The audio of the AUX L IN and the AUX R IN can be heard in stereo by the HEADSET via IC8. (The audio of the AUX L IN and the AUX R IN do not pass through the STRNDENT/R VOLUME and PROGRAM/L VOLUME. Therefore, adjust the volume on the AUX equipment.)
In addition, the audio signals of the AUX L IN and the AUX R IN are mixed at IC4 and are also output to the MONI pin. Thus, the audio of the AUX can by monitored at the console.

(2) $\overline{\text{MTC-MONI}}$ signal

A constant volume is normally output from the MONI pin and does not depend on the STUDENT/R VOLUME or PROGRAM/L VOLUME. However, the audio after the VOLUME is output when the ER-8020 is used as a master recorder.
The playback sound from the tape is normally output from the playback head -> IC3 -> IC5 -> Q16, Q17 switch -> IC4 -> MONI pin. The $\overline{\text{MTC-MONI}}$ signal is low at the master recorder, and the signal of the HEADSET PHONE (R) is output to the MONI pin, that is, from the playback head -> IC3 -> IC5 -> IC7 -> VOLUME -> IC8 -> Q18 switch -> IC4 -> MONI pin.

(3) Flow of theaching material sound

In the ER-9060 system, etc., the sound of the teaching material (the sound of the PGM pin) sent from the console is mixed with students' MIC sound, which is sent to the console from the MONI pin again. In the LLC-9000 system, the MONI pin sound is heard when the students' voice is monitored from the console.
However, to simply achieve the fixed "PAIR" function, the sound of the PGM pin is not sent to the console in the LLC-8000 system.
Therefore, in the LLC-8000 system, the MONI pin sound of the ER-8020 is mixed with the teaching material sound in the console when the students' voice is monitored.



7-2-2. Audio Control Signal Table

Pin No. of CN4/AU-242 board	Signal	H / L voltage (v)	Special mode												
			ON	PLAY (L+R mode)	PLAY (LL mode)	PLAY (RR mode)	PLAY (LR mode)	REC + PLAY	DRILL	X2 REC	MTC mode ON **	PLAY L channel	PLAY L+R channels	PLAY R channel	REC
1	GND	0	-	-	-	-	-	-	-	-	-	-	-	-	-
2	GND (MTR)	0	-	-	-	-	-	-	-	-	-	-	-	-	-
3	+5 V	5	-	-	-	-	-	-	-	-	-	-	-	-	-
4	COLD	0	-	-	-	-	-	-	-	-	-	-	-	-	-
5	D. SIG	4.6 / 0	H	H	H	H	H	H	H	H	H	H	H	H	H
6	PWR (A , R)	15	-	-	-	-	-	-	-	-	-	-	-	-	-
7	PWR (C)	12 / 0	L	H	H	H	H	H	H	H	L	H	H	H	H
8	LID OPEN	4.8 / 0	L	L	L	L	L	L	L	L	L	L	L	L	L
9	ATT	4.7 / 0	L	L	L	L	L	L	L	L	L	L	L	L	L
10	$\overline{\text{BIAS}}$	4.8 / 0.1	H	H	H	H	H	L	L	L	H	H	H	H	L
11	$\overline{\text{PGM - MONI}}$	0.8 / 0	L	Ⓛ	H	H	H	L	L	H	H	H	H	H	L
12	$\overline{\text{MTC - MONI}}$	0.8 / 0	H	H	H	H	H	H	H	H	L	L	L	L	H
13	$\overline{\text{PLAY - R}}$	0.8 / 0	H	L	H	L	H	H	H	H	H	H	H	H	H
14	$\overline{\text{PLAY - L}}$	2.9 */ 0	H	L	L	H	L	H	L	H	H	H	H	H	H
15	DRILL	4.7 / 0	L	L	L	L	L	L	H	L	L	L	L	L	L
16	CAP KICK	5.0 / 0	L	L	L	L	L	L	L	L	L	L	L	L	L
17	$\overline{\text{S - MIC}}$	0.8 / 0	H	H	H	H	H	L	L	H	H	H	H	H	Ⓛ
18	$\overline{\text{INCOM - REC}}$	0.8 / 0	H	H	H	H	H	L	L	L	H	H	H	H	L
19	$\overline{\text{DETECT - R}}$	4.8 / 0	H	H	H	L	L	H	H	H	H	H	L	L	d
20	$\overline{\text{PB - R}}$	0.8 / 0	H	L	H	L	L	H	H	H	H	H	L	L	H
21	$\overline{\text{PB - L}}$	2.9 / 0.1	H	L	L	H	H	H	L	H	H	L	L	H	H
22	REC - R	4.8 / 0	L	L	L	L	L	H	H	L	L	L	L	L	Ⓗ
23	REC - L	5.0 / 0.3	L	L	L	L	L	H	L	H	L	L	L	L	H
24	$\overline{\text{SOUND}}$	5.0 / 0.7	H	a	a	b	c	H	a	H	H	a	c	b	H
25	CAP	4.2 / 0	L	H	H	H	H	H	H	H	L	H	H	H	H
26	X2	4.8 / 0	L	Ⓛ	Ⓛ	Ⓛ	Ⓛ	L	L	H	L	Ⓛ	Ⓛ	Ⓛ	Ⓛ
27	X1	4.5 / 0.1	H	Ⓗ	Ⓗ	Ⓗ	Ⓗ	H	H	L	H	Ⓗ	Ⓗ	Ⓗ	Ⓗ

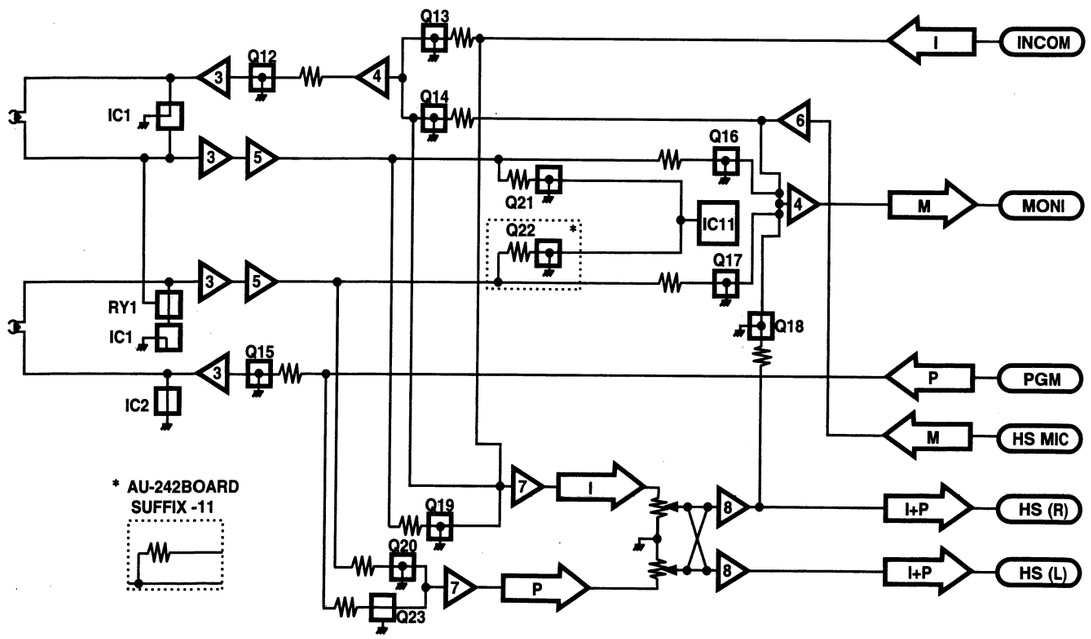
○: At the time of double speed, L (low) and H (high) are reversed.
(Example) When double speed PLAY (L + R mode) is played, pins 11 and 26 are H, and pin 27 is L.
a: When the tape recorded with the sound of approximately more than -15 dB is played back in the L channel, the pin is H.
b: When the tape recorded with the sound of approximately more than -15 dB is played back in the R channel, the pin is H.
c: When the tape recorded with the sound of approximately more than -15 dB is played back in the L or R channel, the pin is H.
d: The value before the operation remains.
*: The high voltage of pin 14 on the boards having a suffix number of 11 is 0.8 v.
**: Refer to 6. Using as a master recorder in section 3-2-2. Function.

7-2-3. Flow Chart of Audio Signal

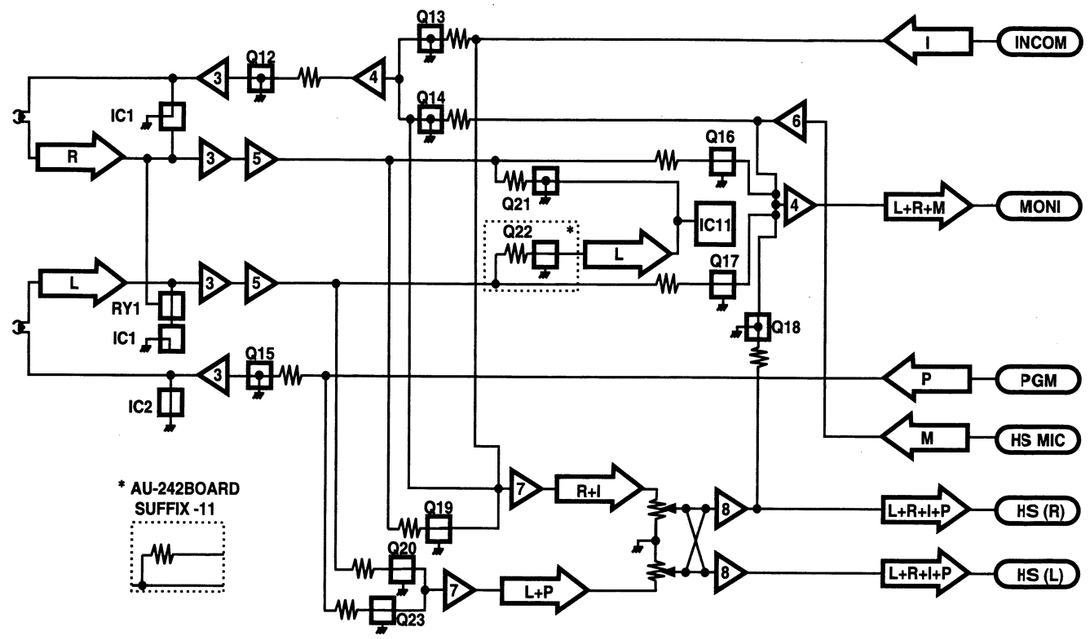
A typical flow chart of audio signals selected from the "Audio (AU-242 Board) Block Didagram" (Refer to Section 7-2-1.) and the "Audio Control Signal Table" (Refer to Section 7-2-2.) is shown.

* In addition, the Q22 base pattern is cut on the AU-242 boards having a suffix number of 11, so Q22 is always OFF. That is, the tape L channel playback signal normally comes into the audio detection circuit of IC11. Refer to section 2-10. Note on Saffix Change.

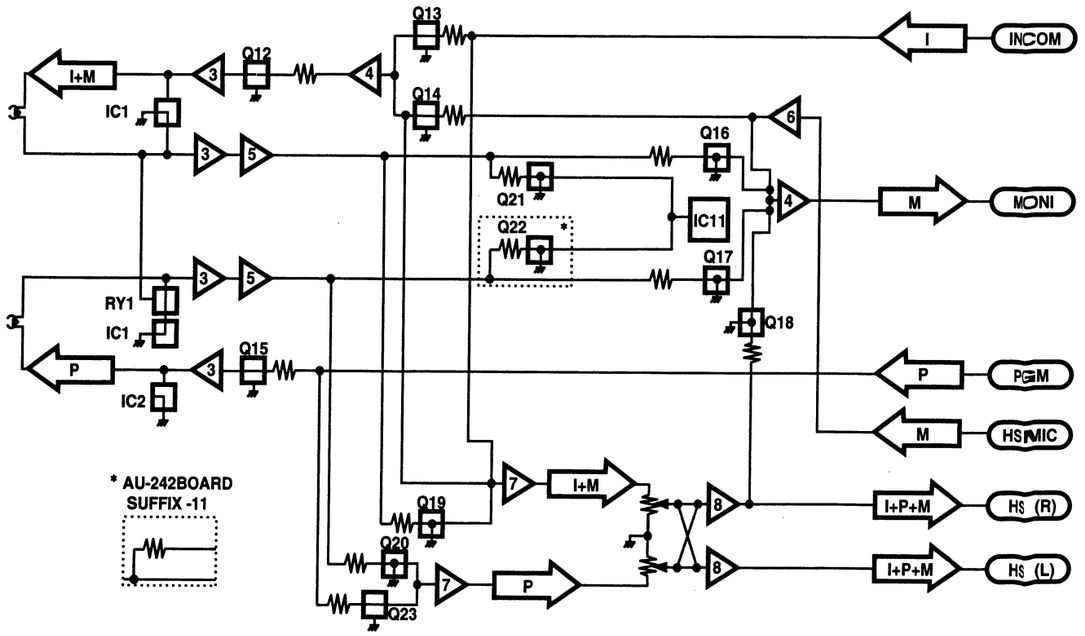
(1) Special mode ON



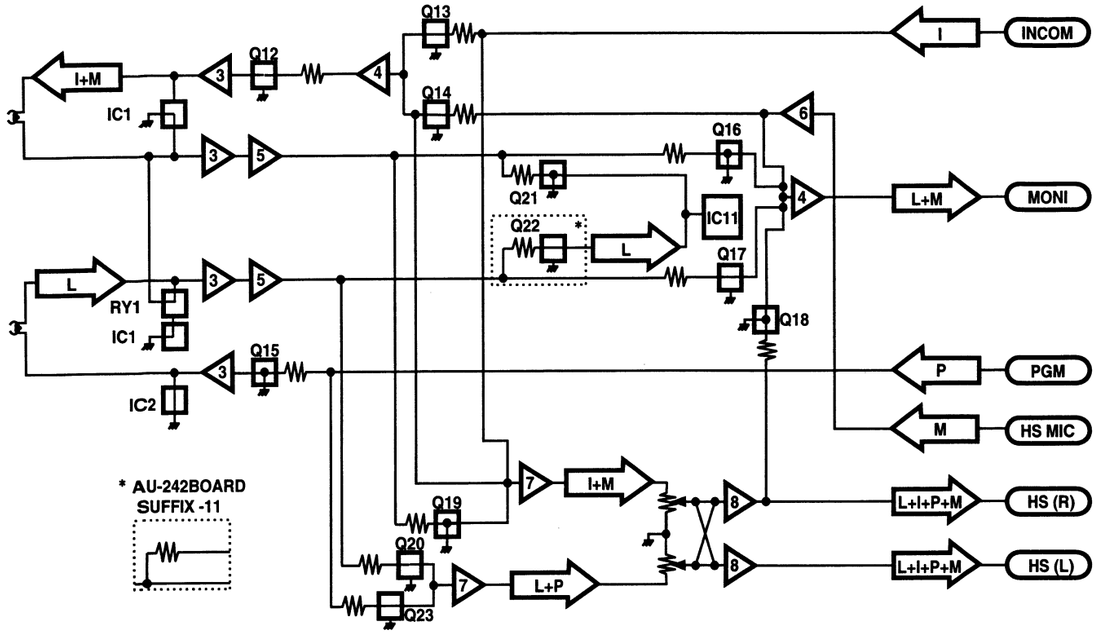
(2) Special mode PLAY (L + R mode)



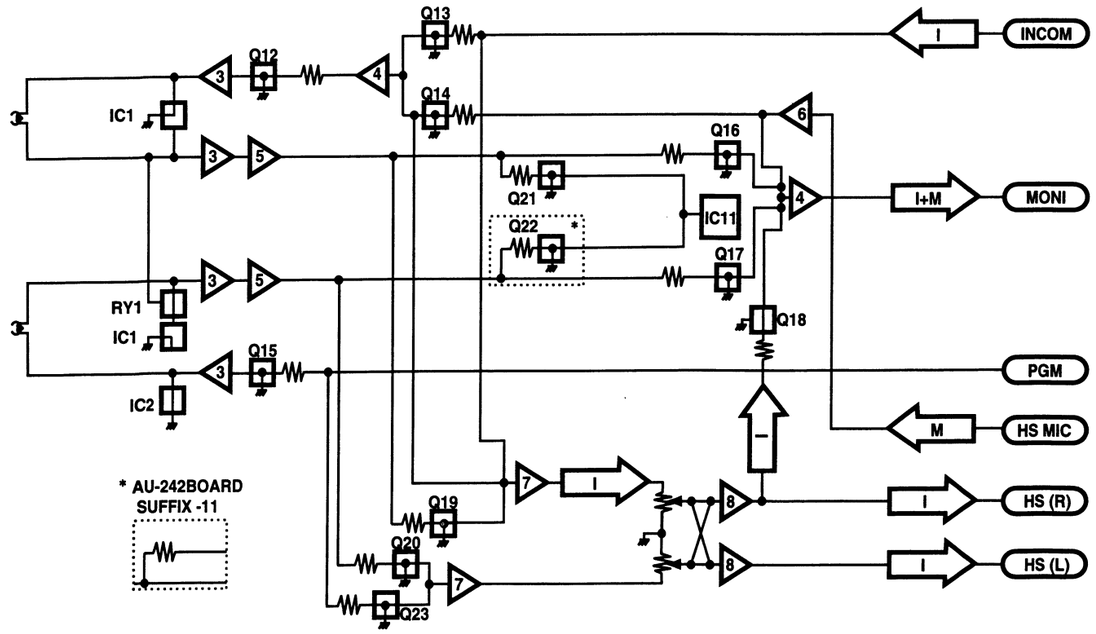
(3) Special mode REC + PLAY



(4) Special mode DRILL



(5) Special mode MTC mode ON



7-7

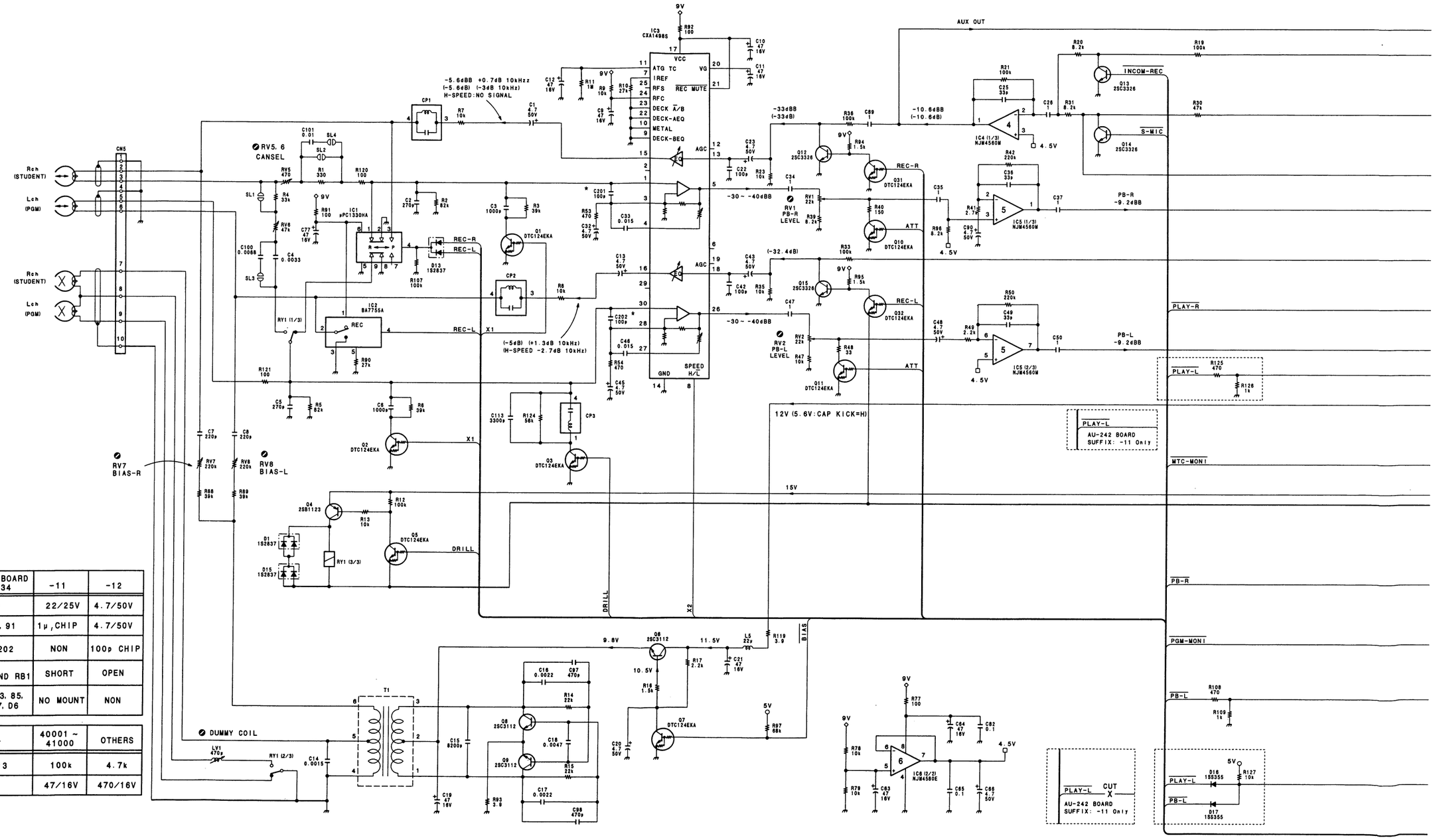
SECTION 8
SCHEMATIC DIAGRAMS

Index

Board	Circuit Function	Page
AU-242	Power Supply & Audio	8-2
CPU-239	CPU	8-4
SW-877	Switch & Display	8-5
Frame Wiring	Frame	8-6

8-1

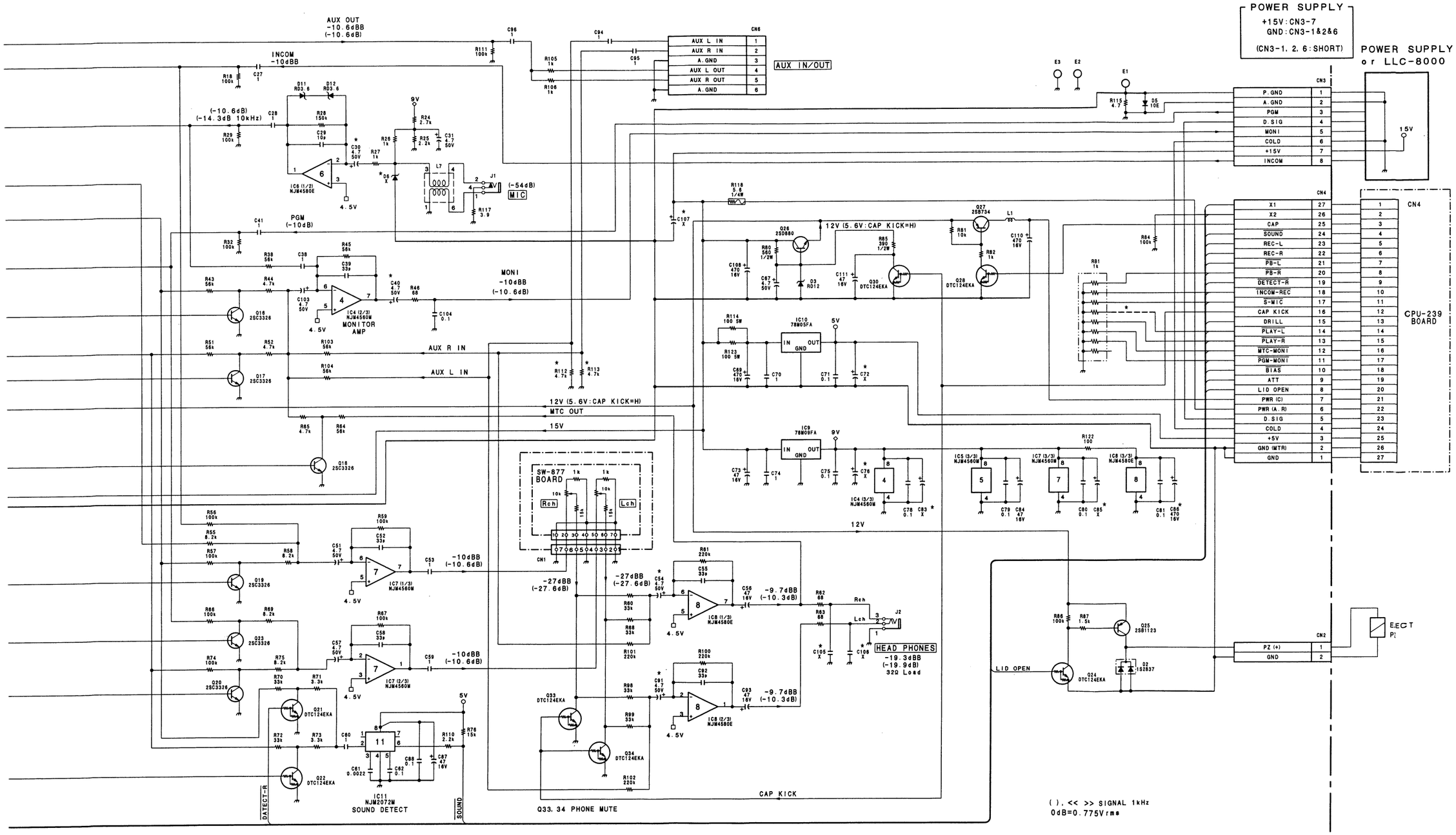
AU-242 BOARD : POWER SUPPLY & AUDIO



*

AU-242 BOARD 1-664-434	-11	-12
C30	22/25V	4.7/50V
C40, 54, 91	1μ, CHIP	4.7/50V
C201, 202	NON	100p CHIP
BETWEEN CN4-14 AND RB1	SHORT	OPEN
C72, 76, 83, 85, C105-107, D6	NO MOUNT	NON

S/No.	40001 ~ 41000	OTHERS
R112, 113	100k	4.7k
C86	47/16V	470/16V

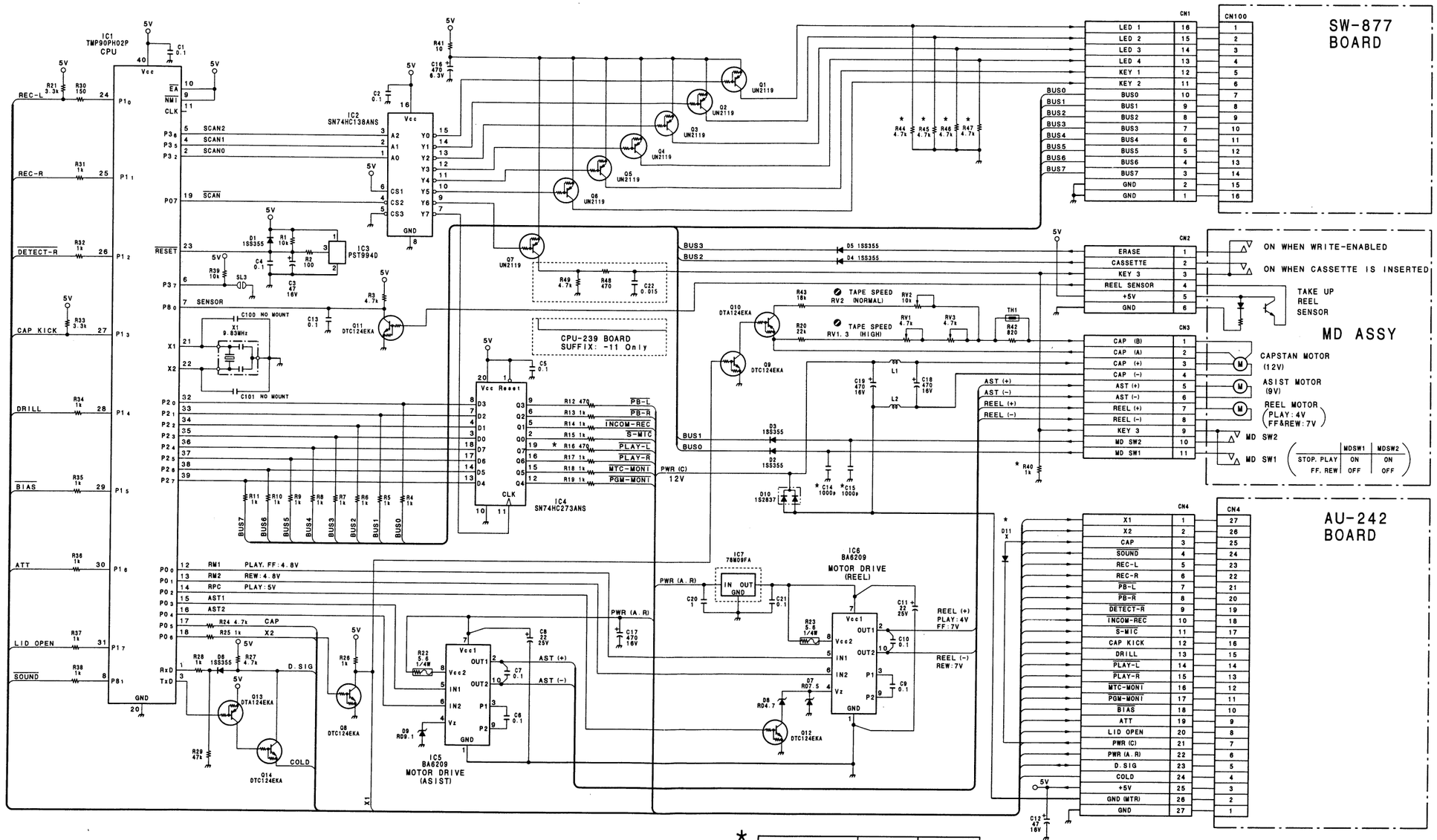


AU-242

BOARD No. 1-66[illegible]434-11,12

B-VER8020-AU242

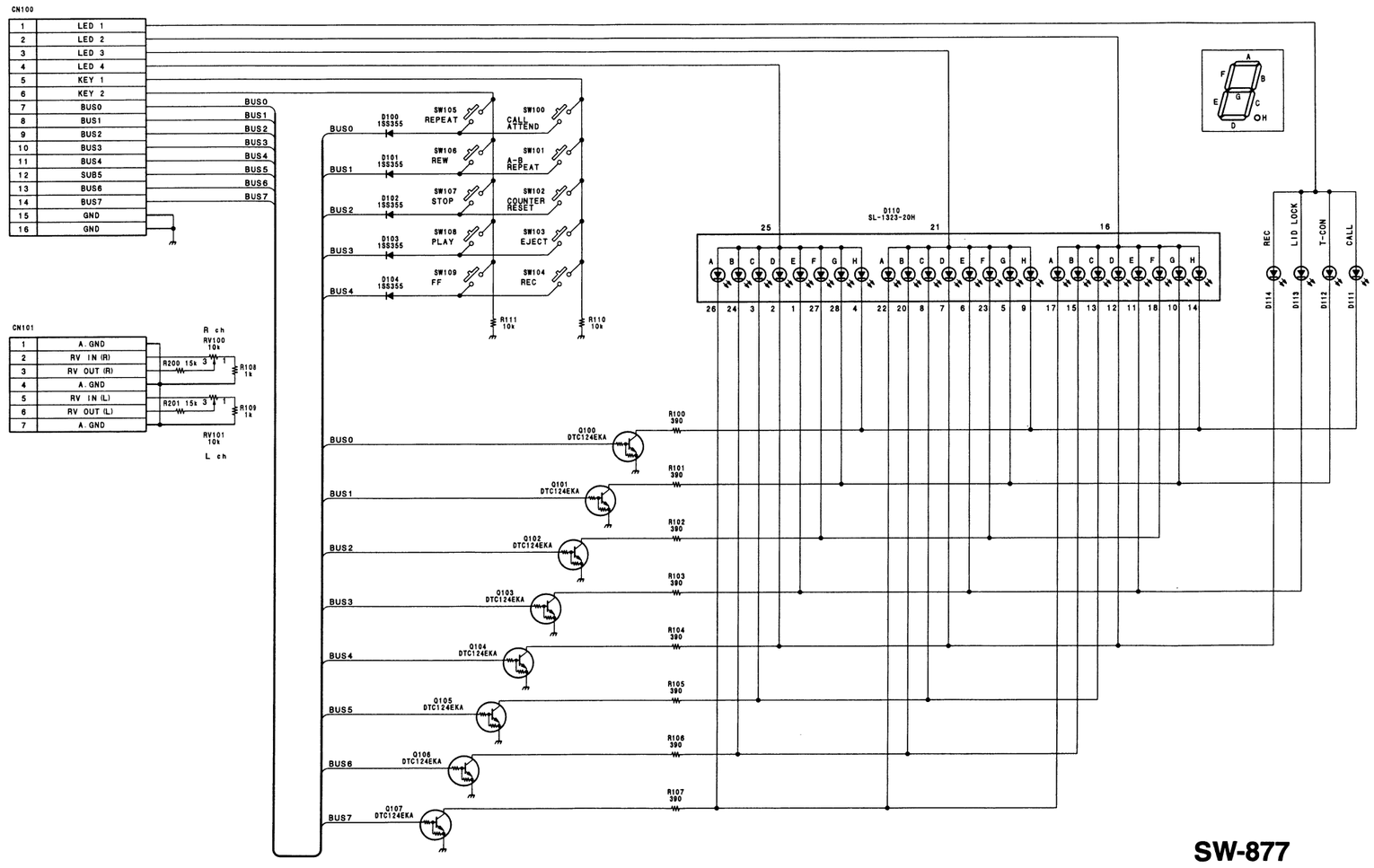
CPU-239 BOARD : CPU



CPU-239 BOARD 1-664-433	-11	-12
R44~47	NON	4.7k
R16	1k	470
R40	1k	NON
C14, 15	1000p	NON
D11	NO MOUNT	NON

CPU-239
BOARD No. 1-664-433-11,12
B-VER8020-CPU239

SW-877 : SWITCH & DISPLAY



SW-877
BOARD No. 1-664-432-12
B-VER8020-SW877

FRAME

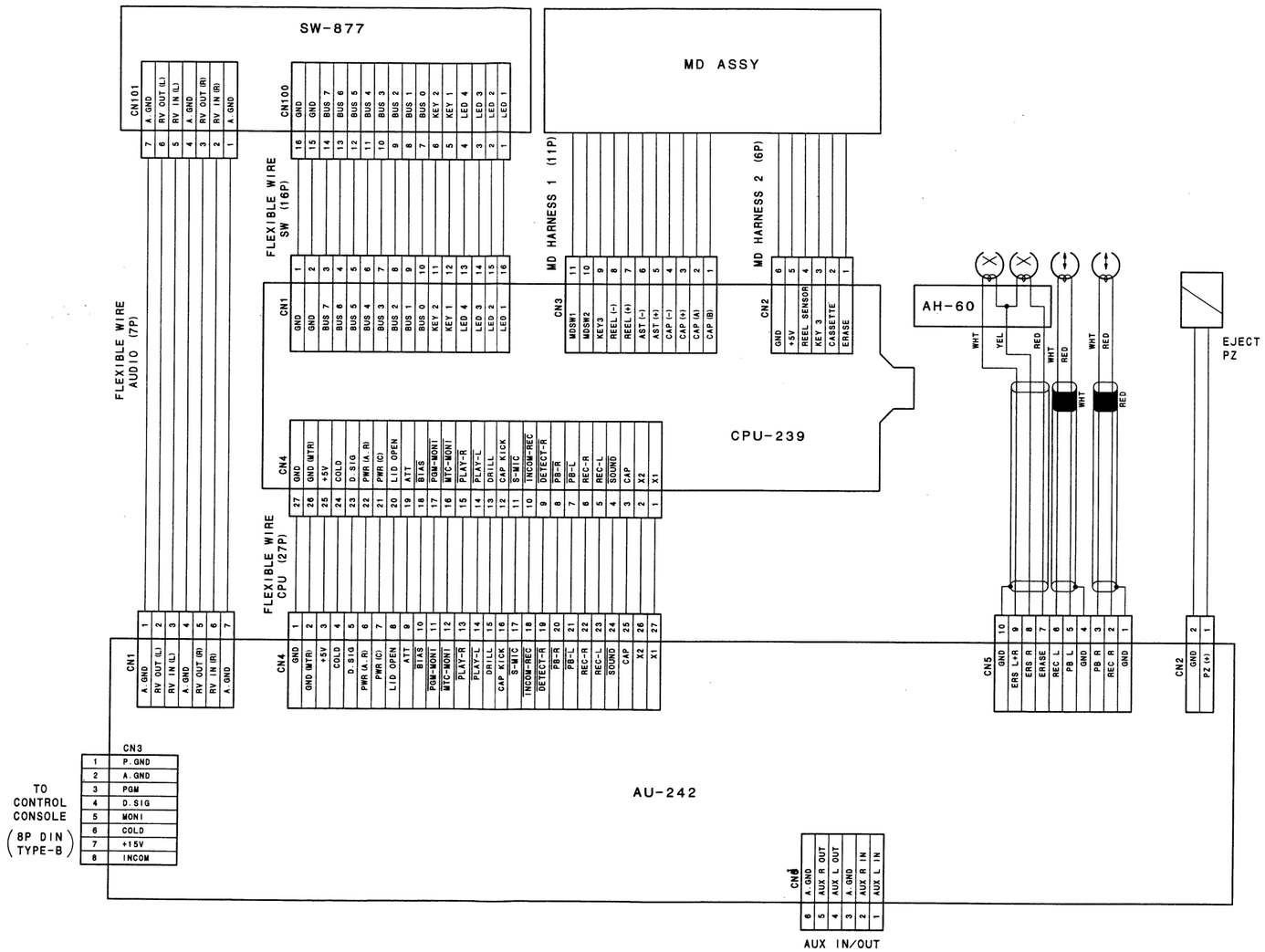
1

2

3

4

5



FRAME WIRING

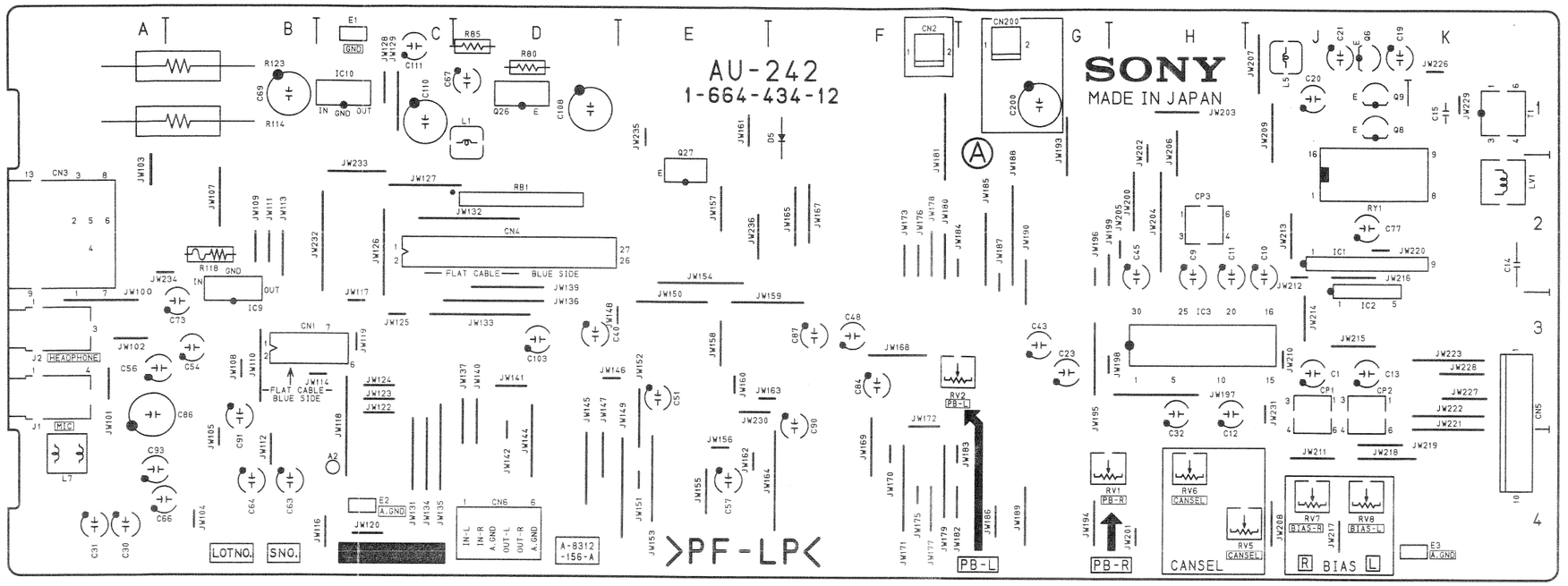
B-¥ER8020-OVERALL

SECTION 9
BOARD LAYOUTS

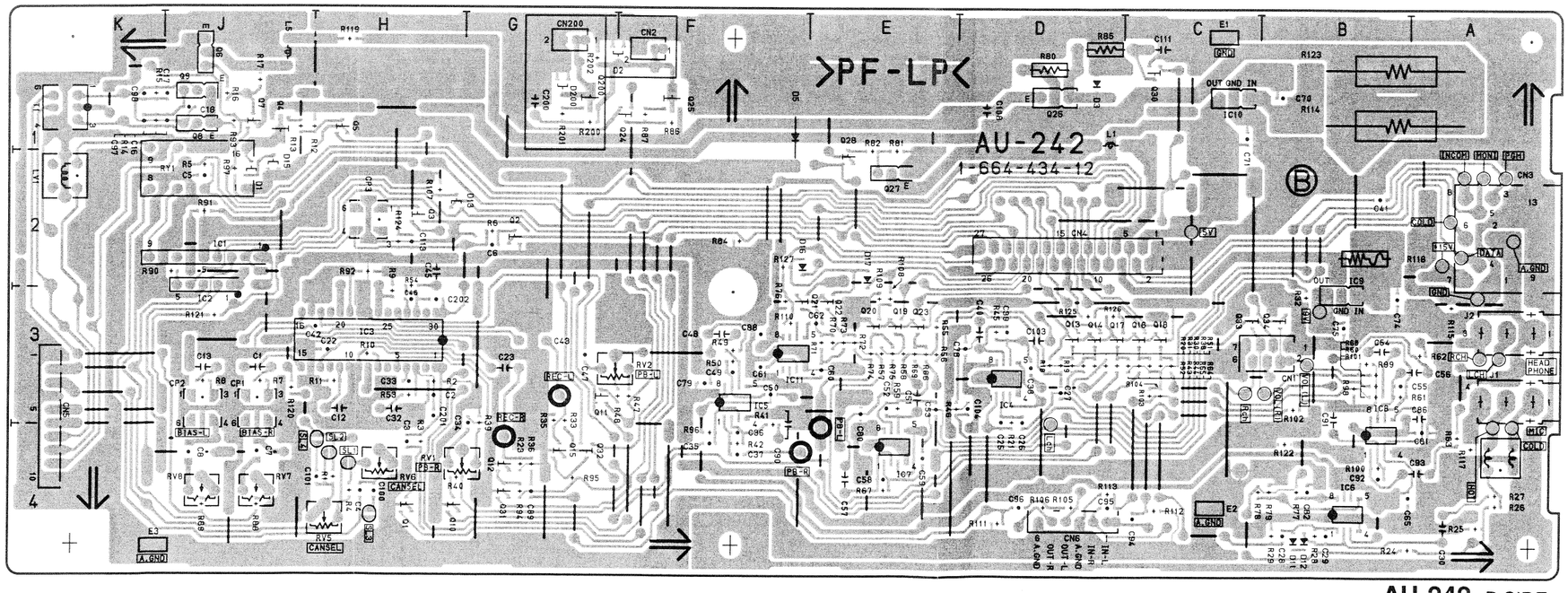
Index

Board	Circuit Function	Page
AU-242 Board	Power Supply & Audio	9-2
CPU-239 Board	CPU	9-4
AH-60 Board	Erase Head	9-4
SW-877 Board	Switch & Display	9-6

AU-242 BOARD : POWER SUPPLY & AUDIO



AU-242 -A SIDE-
1-664-434-12

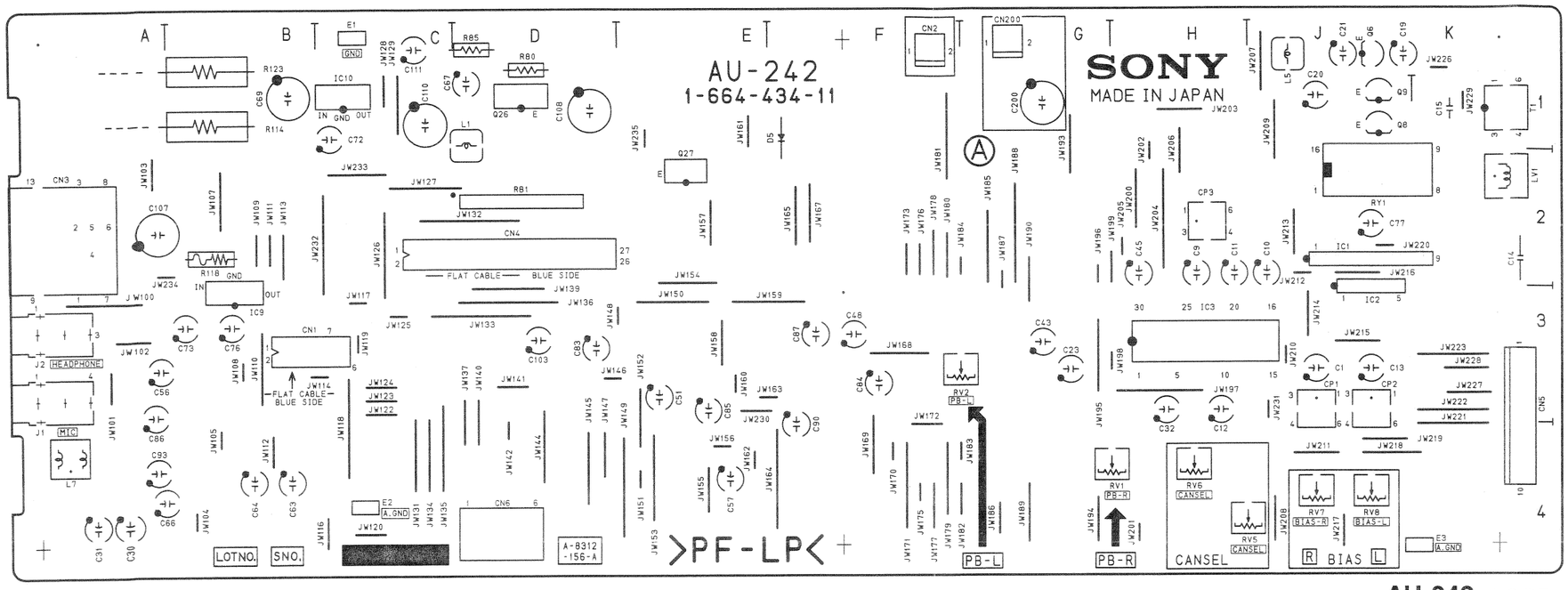


AU-242 -B SIDE-
1-664-434-12

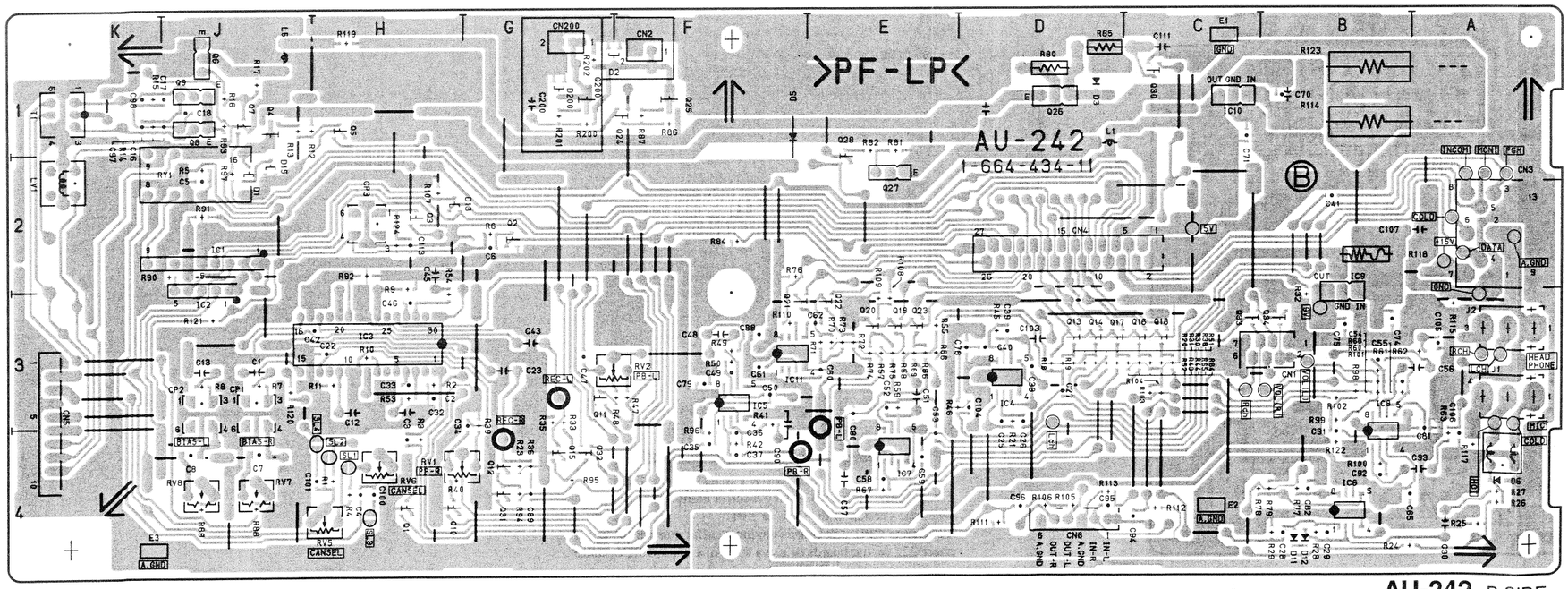
AU-242 BOARD (1-664-434-12)

CN1	B3
CN2	F1
CN3	A2
CN4	D2
CN5	K3
CN6	D4
CP1	J3
CP2	J3
CP3	H2
D1	*J2
D2	*G1
D3	*D1
D5	F1
D11	*B4
D12	*B4
D13	*H2
D15	*J2
D16	*F2
D17	*E2
E1	C1
E2	C4
E3	K4
IC1	J2
IC2	J2
IC3	H3
IC4	*D3
IC5	*F3
IC6	*B4
IC7	*B4
IC8	*B4
IC9	B3
IC10	C1
IC11	*F3
J1	A3
J2	A3
LV1	K2
Q1	*H4
Q2	*G2
Q3	*H2
Q4	*J1
Q5	*H1
Q6	J1
Q7	*J1
Q8	J1
Q9	J1
Q10	*H4
Q11	*G3
Q12	*G4
Q13	*D3
Q14	*D3
Q15	*G4
Q16	*C3
Q17	*D3
Q18	*C3
Q19	*E3
Q20	*E3
Q21	*F3
Q22	*E3
Q23	*E3
Q24	*F1
Q25	*F1
Q26	D1
Q27	E2
Q28	*E2
Q30	*C1
Q31	*G4
Q32	*G4
Q33	*C3
Q34	*B3
RB1	D2
RV1	G4
RV2	F3
RV5	H4
RV6	H4
RV7	J4
RV8	J4
RY1	J2
T1	K1

*: B SIDE



AU-242 -A SIDE-
1-664-434-11



AU-242 -B SIDE-
1-664-434-11

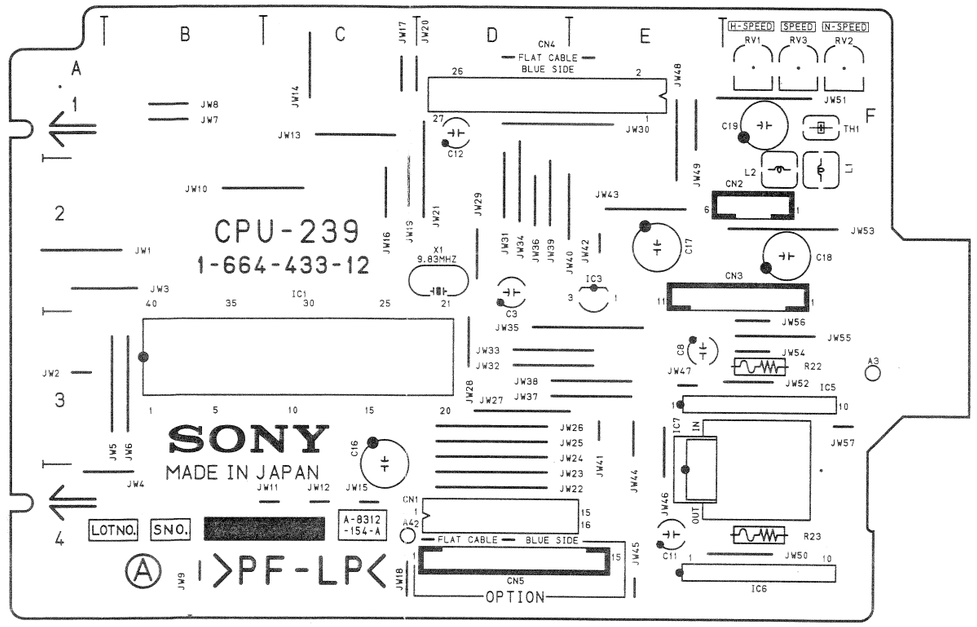
AU-242 BOARD (1-664-434-11)

CN1	B3	Q5	*H1
CN2	F1	Q6	J1
CN3	A2	Q7	*J1
CN4	D2	Q8	J1
CN5	K3	Q9	J1
CN6	D4	Q10	*H4
		Q11	*G3
CP1	J3	Q12	*G4
CP2	J3	Q13	*D3
CP3	H2	Q14	*D3
		Q15	*G4
D1	*J2	Q16	*C3
D2	*G1	Q17	*D3
D3	*D1	Q18	*C3
D5	F1	Q19	*E3
D11	*B4	Q20	*E3
D12	*B4	Q21	*F3
D13	*H2	Q22	*E3
D15	*J2	Q23	*E3
		Q24	*F1
E1	C1	Q25	*F1
E2	C4	Q26	D1
E3	K4	Q27	E2
		Q28	*E2
IC1	J2	Q30	*C1
IC2	J2	Q31	*G4
IC3	H3	Q32	*G4
IC4	*D3	Q33	*C3
IC5	*F3	Q34	*B3
IC6	*B4		
IC7	*E4	RB1	D2
IC8	*B4		
IC9	B3	RV1	G4
IC10	C1	RV2	F3
IC11	*F3	RV5	H4
		RV6	H4
J1	A3	RV7	J4
J2	A3	RV8	J4
LV1	K2	RY1	J2
Q1	*H4	T1	K1
Q2	*G2		
Q3	*H2		
Q4	*J1	*: B SIDE	

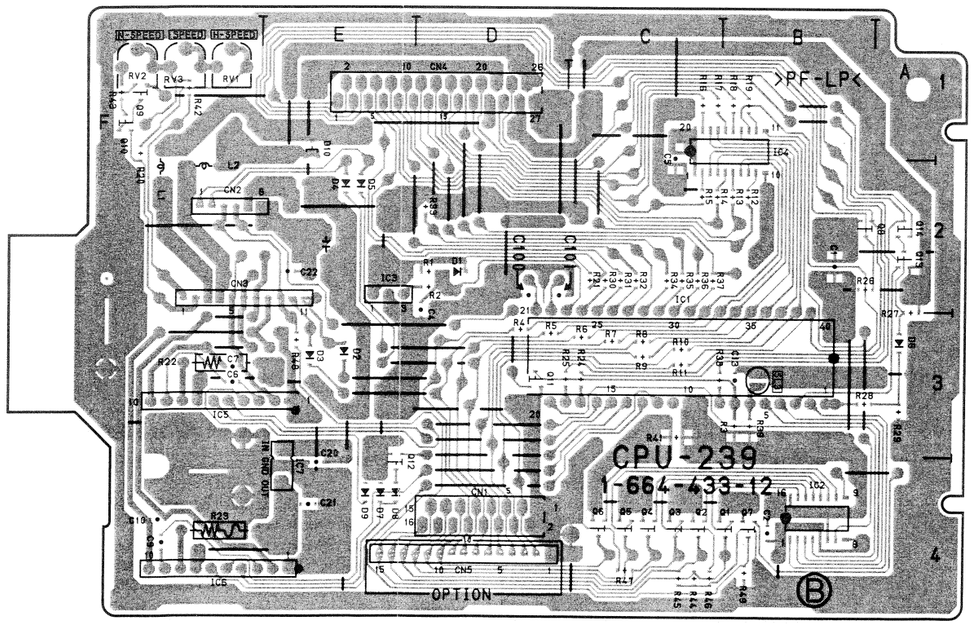
NOTE:
When Used As Master TC on AU-242 Boards Having Suffix Number 11

The tape L channel playback signal normally comes into the audio detection circuit of the IC11 on the AU-242 boards having a suffix number of 11. Therefore, the repeat function and the PME function respond to both R and L channels even when the teacher sets the playback mode to only the R channels when using it as the master TC.
To adjust the playback mode to the repeat function, etc., connect the AU-242 board Q22 base to the part where the foil pattern is cut between pins CN4 and CN21.
(Connect the Q22 base to the part between pins CN4 and CN21.)

CPU-239 BOARD : CPU



CPU-239 -A SIDE-
1-664-433-12



CPU-239 -B SIDE-
1-664-433-12

```
-----------------------------
CPU-239 BOARD (1-664-433-12)
-----------------------------

CNI1      B3

CN1       D4
CN2       F2
CN3       F2
CN4       D1

D1       *D2
D2       *E3
D3       *E3
D4       *E2
D5       *E2
D6       *A3
D7       *E4
D8       *E4
D9       *E4
D10      *E1

IC1       B3
IC2      *B4
IC3       E2
IC4      *B1
IC5       F3
IC6       F4
IC7       E4

Q1       *B4
Q2       *C4
Q3       *C4
Q4       *C4
Q5       *C4
Q6       *C4
Q7       *B4
Q8       *B2
Q9       *F1
Q10      *F1
Q11      *D3
Q12      *E4
Q13      *A2
Q14      *A2

RV1       F1
RV2       F1
RV3       F1

TH1       F1

X1        D2

*: B SIDE
```

NOTE:

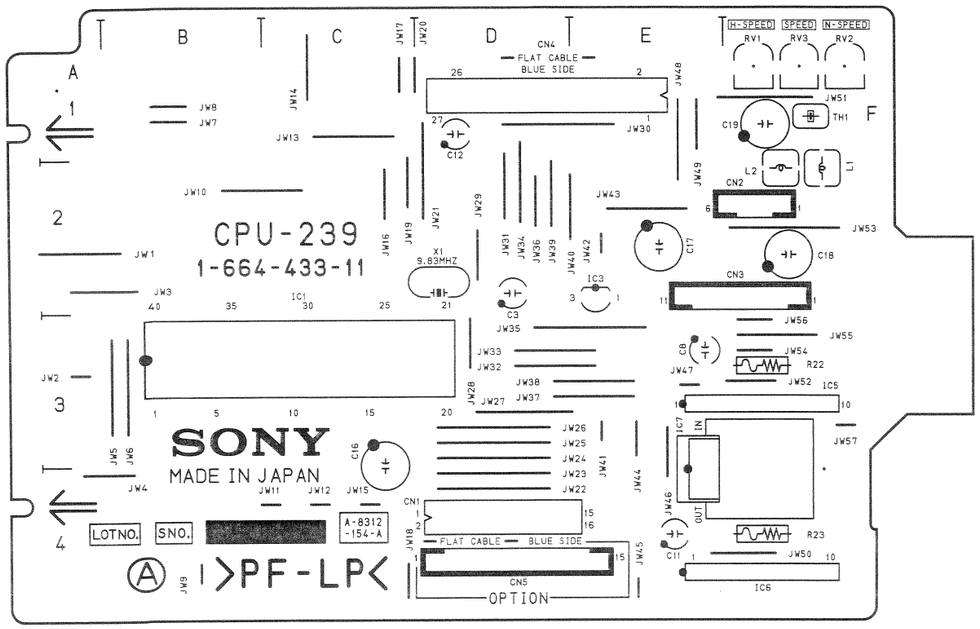
CPU-239 Boards Having Suffix Number 12

Those CPU-239 boards having a suffix number of 12 do not operate when the version of the CPU is 1.01.
To operate CPU-239 boards having a suffix number of 12, short C22 on the boards or use a CPU of version 1.02 or more.

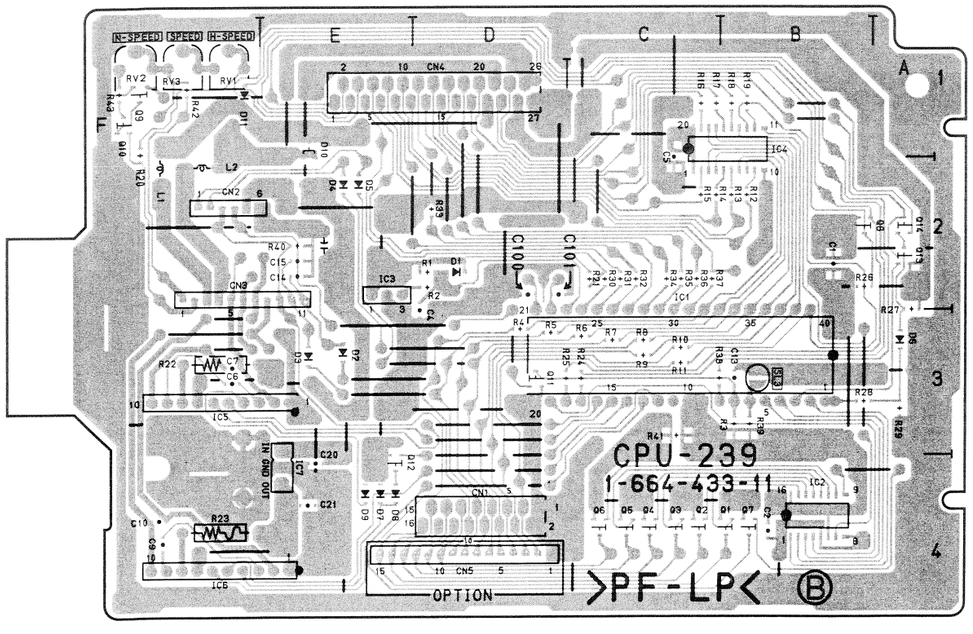
AH-60 BOARD : ERASE HEAD

AH-60 -A SIDE-
1-664-435-12

AH-60 -B SIDE-
1-664-435-12



CPU-239 -A SIDE-
1-664-433-11



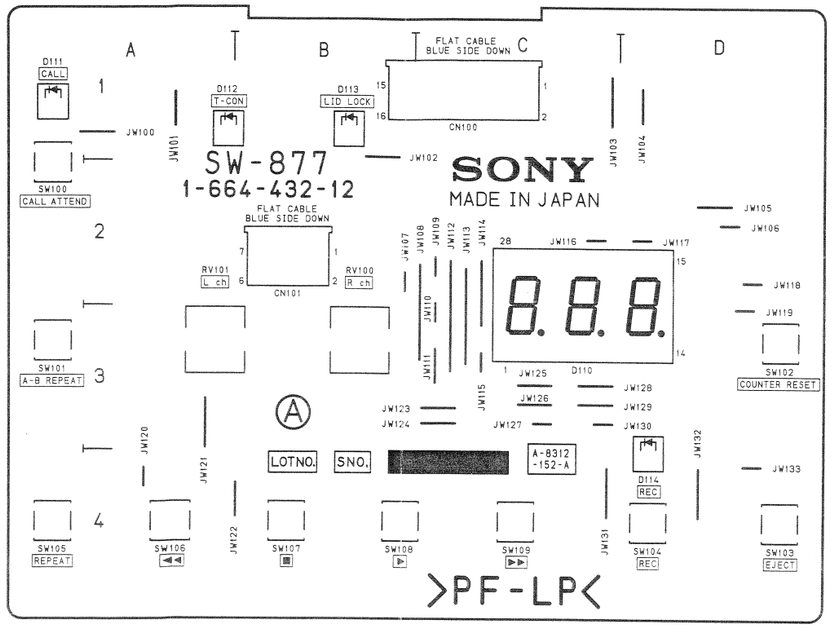
CPU-239 -B SIDE-
1-664-433-11

CPU-239 BOARD (1-664-433-11)

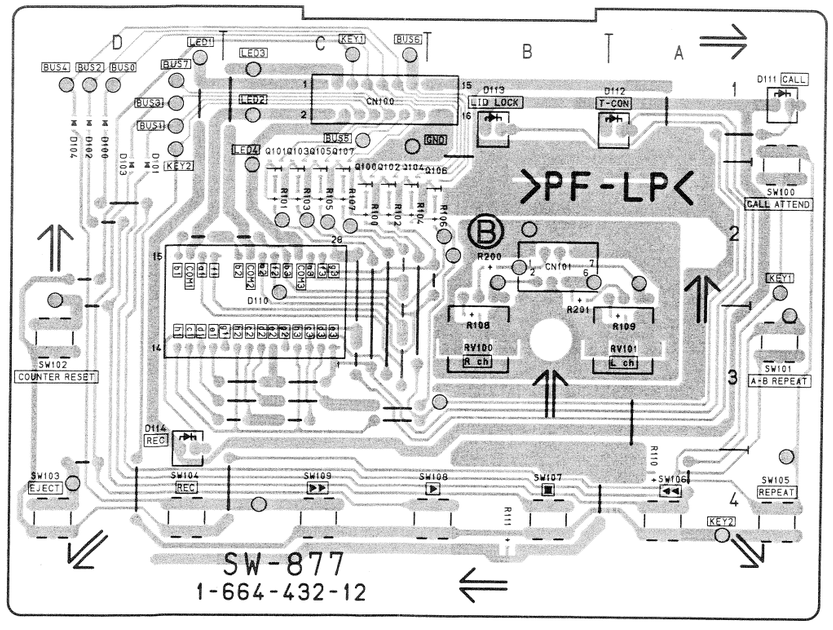
CNI1	B3
CN1	D4
CN2	F2
CN3	F2
CN4	D1
D1	*D2
D2	*E3
D3	*E3
D4	*E2
D5	*E2
D6	*A3
D7	*E4
D8	*E4
D9	*E4
D10	*E1
IC1	B3
IC2	*B4
IC3	E2
IC4	*B1
IC5	F3
IC6	F4
IC7	E4
Q1	*B4
Q2	*C4
Q3	*C4
Q4	*C4
Q5	*C4
Q6	*C4
Q7	*B4
Q8	*B2
Q9	*F1
Q10	*F1
Q11	*D3
Q12	*E4
Q13	*A2
Q14	*A2
RV1	F1
RV2	F1
RV3	F1
TH1	F1
X1	D2

*: B SIDE

SW-877 BOARD : SWITCH & DISPLAY



SW-877 -A SIDE-
1-664-432-12



SW-877 -B SIDE-
1-664-432-12

```
--------------------------
SW-877 BOARD (1-664-432-12)
--------------------------

CN100    C1
CN101    B2

D100    *D1
D101    *D2
D102    *D1
D103    *D2
D104    *D1
D110     C2
D111     A1
D112     A1
D113     B1
D114     D4

Q100    *C2
Q101    *C2
Q102    *C2
Q103    *C2
Q104    *C2
Q105    *C2
Q106    *B2
Q107    *C2

RV100    B3
RV101    A3

SW100    A2
SW101    A3
SW102    D3
SW103    D4
SW104    D4
SW105    A4
SW106    A4
SW107    B4
SW108    B4
SW109    C4

*: B SIDE
```